Since its inception in 1984, the University of Illinois Insect Management and Insecticide Efficacy 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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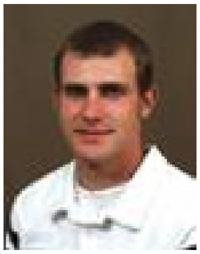

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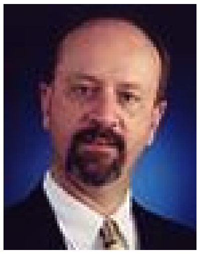

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CORN

SOYBEANS

APPENDIX

SECTION 1

Evaluation of products to control corn rootworm larvae *(Diabrotica spp.)* in Illinois, 2006

Ronald E. Estes, Jared B. Schroeder, Kevin L. Steffey, and Michael E. Gray

Location

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

Experimental Design and Methods

The experimental design was a randomized complete block with four replications. The plot size for each treatment was 10 ft (four rows) x 30 ft. Five randomly selected root systems were extracted from the center two rows of each plot on 17, 18, 24, and 25 July at Urbana, Perry, Monmouth, and DeKalb, respectively. The root systems were washed and then rated for corn rootworm larval injury using the 0 to 3 node-injury scale developed by Oleson et al. (2005) (Appendix I). Percentage consistency (percentage of roots with a node-injury rating less than 1.0) was determined for each product at each location. Root systems were extracted from a subset of treatments at Urbana, Monmouth, and DeKalb again on 7 and 8 August to assess late-season rootworm injury. These root systems also were washed and rated (0 to 3 node-injury scale) for corn rootworm larval injury.

Planting and Insecticide Application

Trials were planted on 24, 27, and 28 April, and on 4 May at Perry, DeKalb, Urbana, and Monmouth, 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. Capture LFR was applied through microtubes into the seed furrow at a spray volume of 5 gal per acre using a CO_2 system. All insecticides

TABLE 1.1 • Agronomic information for efficacy trials with products to control corn rootworm larvae, University of Illinois, 2006

	DeKalb	Monmouth	Perry	Urbana
Planting date	27 April	4 May	24 April	28 April 6 May[1]
Root evaluation dates	25 July 8 August	24 July 8 August	18 July	17 July 7 Augus
Hybrids[2]	DKC61-72 DKC61-68 YGRW Pioneer 34A16 Pioneer 34A18 HxRW	DKC61-72 DKC61-68 YGRW Pioneer 34A16 Pioneer 34A18 HxXTRA Mycogen 2784 Mycogen 2G777 HxRW Mycogen 2P788 HxXTRA	DKC61-72 DKC61-68 YGRW Pioneer 34A16 Pioneer 34A18 HxXTRA	DKC61-72 DKC61-68 YGRW Pioneer 34A16 Pioneer 34A18 HxXTRA Mycogen 2784 Mycogen 2G777 HxRW Mycogen 2P788 HxXTRA
Row spacing	30 inches	30 inches	30 inches	30 inches
Seeding rate	33,000/acre	33,000/acre	33,000/acre	3,000/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] Mycogen hybrids in Urbana were planted 1 week later (6 May) than the rest of the trial (28 April).
[2] All seed-applied insecticides and soil insecticides were applied to DKC61-72 (the non-rootworm trait isoline of DKC61-68 YGRW), unless otherwise listed.

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.

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 II.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.0.5. (Copyright© 1982–2003 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

DeKalb—Mean node-injury ratings and consistency percentages for rootworm injury evaluations on 25 July are presented in Table 1.2. The mean node-injury ratings in the untreated checks (UTC) were 2.01 (Pioneer 34A16 + Poncho 250) and 2.07 (DKC61-72), indicating that corn rootworm larval feeding was severe (two nodes of roots destroyed) in the trial. The node-injury ratings for the plots treated with Capture LFR and the four plots treated with experimental seed treatments ('V' treatments) did not differ significantly from the node-injury ratings for either of the untreated checks. Nearly all registered products provided acceptable root protection (less than one node of roots destroyed), except Fortress 2.5G and Poncho 1250. The mean node-injury ratings for the transgenic Bt hybrids HxXTRA (Pioneer 34A18 + Poncho 250) and YGRW (DKC61-68 + Poncho 250) were less than 0.5. The mean node-injury rating for HxXTRA was significantly lower than the mean node-injury rating for every other product in the experiment.

Percentage consistency ranged from 0 to 95%, indicating that at least one root system in every treatment had a node-injury rating of 1.0 or greater. The seed treatments (Poncho 1250 and the experimental 'V' treatments) offered the least consistent root protection compared with all other treatments. The most consistent protection against rootworm injury (at least 75%) was provided by Aztec 2.1G, Aztec 4.67G, Force 3G, HxXTRA, and YGRW.

Late-season rootworm injury in five treatments was assessed on 8 August (Table 1.3). Rootworm injury in all treatments changed only slightly from the levels of rootworm injury assessed on 25 July. The node-injury rating in the untreated check (DKC61-72) on 8 August was 2.15, significantly greater than the node-injury rating for any of the other treatments. The node-injury ratings for the two transgenic Bt hybrids, YGRW and HxXTRA, were not significantly different. Both transgenic products provided 100% consistency on 8 August.

Monmouth—Mean node-injury ratings and consistency percentages for rootworm injury evaluations on 24 July are presented in Table 1.4. Rootworm larval injury was severe in the untreated checks (UTC), with mean node-injury ratings of 2.90 (Mycogen 2784), 2.56 (Pioneer 34A16 + Poncho 250), and 2.98 (DKC61-72). Rootworm injury in all other treatments was significantly less than in the untreated checks. There were no significant differences in node-injury ratings for Aztec 2.1G, Aztec 2.1G + Poncho 250, and Aztec 2.1G + Poncho 1250, indicating that the addition of a seed-applied insecticide with Aztec did not improve root protection from rootworms. Protection against rootworm injury by the granular soil insecticides Aztec 2.1G, Aztec 4.67G, Force 3G, Fortress 2.5G, Fortress 5G, and Lorsban 15G was good to excellent, with typically less than ½ node of roots pruned. The level of rootworm injury to the transgenic Bt hybrids (HxRW, HxXTRA, and YGRW) was low on 24 July.

Percentage consistency ranged from 0 to100%. Nearly every product provided root protection at a consistency level of at least 80%. Several treatments were 100% consistent, including Aztec 2.1G (6.7 oz), Aztec 2.1G + Poncho 250, Aztec 2.1G + Poncho 1250, and Fortress 5G. The percentage consistencies of the transgenic Bt corn hybrids were 80% (HxXTRA Mycogen 2P788 + Cruiser 250), 85% (YGRW), and 95% (HxRW Mycogen 2G777 + Cruiser 250, and HxXTRA Pioneer 34A18 + Poncho 250), similar to the percentage consistencies of the soil insecticides.

Late-season rootworm injury in five treatments was assessed on 8 August (Table 1.5). Slight increases in the level of rootworm injury occurred between 24 July and 8 August in all treatments. The mean node-injury rating in the untreated check (UTC) was significantly greater than the mean node-injury ratings for any of the rootworm control products on 8 August. The mean node-injury rating in the plots treated with Poncho 1250 was significantly greater than the mean node injury ratings

TABLE 1.2 • Evaluation of products to control corn rootworm larvae, DeKalb, University of Illinois, 25 July, 2006

Product[1]	Rate[2,3]	Placement[2,3]	Mean node-injury rating[4,5,6,7]	% consistency[8]
Aztec 2.1G	6.7	Band	0.58 gh	85
Aztec 2.1G[9]	8	Band	0.48 h	90
Aztec 2.1G + Poncho 250	6.7 0.25	Band Seed	0.96 efg	60
Aztec 2.1G + Poncho 1250	4 1.25	Band Seed	0.52 gh	80
Aztec 4.67G[10]	3	Furrow	0.54 gh	80
Capture LFR	8	Furrow	1.6 a–d	23
Force 3G	4	Band	0.55 gh	85
Fortress 2.5G	8	Furrow	1.28 def	30
Fortress 5G[10]	4	Furrow	0.71 fgh	65
Lorsban 15G	8	Band	0.8 fgh	65
Poncho 1250	1.25	Seed	1.24 cde	5
V-10112 1.77 SC	1.25	Seed	1.94 a–d	15
V-10112 1.77 SC	1.5	Seed	2.22 a	5
V-10170 2.32 SC	1.25	Seed	1.52 a–d	5
V-10194	1.25	Seed	1.44 b–e	5
V-10194	1.5	Seed	1.35 ef	25
HxXTRA (Pioneer 34A18) + Poncho 250	— 0.25	— Seed	0.08 i	95
Pioneer 34A16[11] + Force 3G + Poncho 250	— 4 0.25	— Band Seed	0.51 gh	95
UTC[12] (Pioneer 34A16)[11] + Poncho 250	— 0.25	— Seed	2.01 ab	0
YGRW (DKC61-68) + Poncho 250	— 0.25	— Seed	0.49 h	75
UTC[12] (DKC61-72)	—	—	2.07 ab	0

[1] All seed-applied insecticides and soil insecticides were applied to DKC61-72, the non-transgenic isoline of DKC61-68 YGRW, unless otherwise listed.
[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. Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).
[7] Statistical analyses were conducted on transformed data; the actual means are shown.
[8] Percentage of roots with a node-injury rating <1.0.
[9] Aztec 2.1G was applied at 8 oz as experimental use only. *Aztec 2.1G is not labeled at this rate of application.* We do not condone the use of rates of application not indicated on the product label.
[10] Applied with modified SmartBox metering units.
[11] Pioneer 34A16 is the non-transgenic isoline of Pioneer 34A18 HxXTRA.
[12] UTC = untreated check.

TABLE 1.3 • Evaluation of products for late-season control of corn rootworm larvae, DeKalb, University of Illinois, 8 August, 2006

Product[1]	Rate[2,3]	Placement[2,3]	Mean node-injury rating[4,5,6]	% consistency[7]
Aztec 2.1G	6.7	Band	0.78 c	69
HxXTRA (Pioneer 34A18) + Poncho 250	— 0.25	— Seed	0.19 d	100
Poncho 1250	1.25	Seed	1.42 b	15
YGRW (DKC61-68) + Poncho 250	— 0.25	— Seed	0.41 d	100
UTC[8] (DKC61-72)	—	—	2.15 a	0

[1] All seed-applied insecticides and soil insecticides were applied to DKC61-72, the non-transgenic isoline of DKC61-68 YGRW, unless otherwise listed.
[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] Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).
[7] Percentage of roots with a node-injury rating <1.0.
[8] UTC = untreated check.

for Aztec 2.1G, HxXTRA, and YGRW. Aztec 2.1G was the most consistent (95%), whereas Poncho 1250 was the least consistent (5%).

Perry—In response to the expanding range of the variant western corn rootworm, we established a corn rootworm product efficacy trial at the Orr Agricultural Research and Demonstration Center located near Perry, Illinois. Mean node-injury ratings and consistency percentages for rootworm injury evaluations on 18 July are presented in Table 1.6. The mean node-injury ratings in the untreated checks (UTC) were 0.41 (DKC61-72) and 0.49 (Pioneer 34A16 + Poncho 250), indicating that rootworm larval densities were low. Although there were statistical differences among some of the mean node-injury ratings, the low level of corn rootworm pressure did not allow for an adequate appraisal of product performance. Percentage consistencies ranged from 79% (Capture LFR) to 100 % (many products). Because of the low level of rootworm injury on 18 July, we did not dig roots a second time.

Urbana—Mean node-injury ratings and consistency percentages for rootworm injury evaluations on 17 July are presented in Table 1.7. The level of corn rootworm larval pressure at the site near Urbana was intense (Table 1.7). Rootworm larval injury was severe in the untreated checks (UTC), with mean node-injury ratings of 2.94 (Mycogen 2784), 2.43 (Pioneer 34A16 + Poncho 250), and 2.95 (DKC61-72). The mean node-injury ratings for all treatments (except the experimental 'V' seed treatments) were significantly lower than the mean node-injury ratings for the untreated checks.

Percentage consistency ranged from 0% to 95%, indicating that at least one root system in every treatment had a node-injury rating of 1.0 or greater. Percentage consistency was 80% or greater for 9 of the 23 treatments. All treatments were greater than 50% consistent except Force 3G, Poncho 1250, YGRW, and each of the experimental 'V' seed treatments. The seed treatments provided the least consistent root protection among the products tested.

Late-season rootworm injury in five treatments was assessed on 7 August (Table 1.8). Rootworm injury in the untreated check (UTC) was 3.0 on 7 August. The mean node-injury rating for HxXTRA was significantly less than the mean node-injury rating for YGRW. The mean node-injury rating for Poncho 1250 was significantly greater than the mean node-injury ratings for the other rootworm control products. Despite intense corn rootworm larval pressure, HxXTRA and Aztec 2.1G provided consistent root protection, 95% and 80%, respectively. The percentage consistency for YGRW on 7 August was 0%.

TABLE 1.4 • Evaluation of products to control corn rootworm larvae, Monmouth, University of Illinois, 24 July, 2006

Product[1]	Rate[2,3]	Placement[2,3]	Mean node-injury rating[4,5,6,7]	% consistency[8]
Aztec 2.1G	6.7	Band	0.23 fg	100
Aztec 2.1G[9]	8	Band	0.19 fg	95
Aztec 2.1G + Poncho 250	6.7 0.25	Band Seed	0.20 fg	100
Aztec 2.1G + Poncho 1250	4 1.25	Band Seed	0.17 fg	100
Aztec 4.67G[10]	3	Furrow	0.20 fg	100
Force 3G	4	Band	0.57 g	80
Fortress 2.5G	8	Furrow	0.39 def	90
Fortress 5G[10]	4	Furrow	0.38 d–g	100
Lorsban 15G	8	Band	0.47 de	95
Poncho 1250	1.25	Seed	1.65 b	15
HxRW (Mycogen 2G777) + Cruiser 250	— 0.25	— Seed	0.22 fg	95
HxXTRA (Mycogen 2P788) + Cruiser 250	— 0.25	— Seed	0.40 efg	80
UTC[11] (Mycogen 2784)[12]	—	—	2.90 a	0
HxXTRA (Pioneer 34A18) + Poncho 250	— 0.25	— Seed	0.24 g	95
Pioneer 34A16[13] + Force 3G + Poncho 250	— 4 0.25	— Band Seed	1.19 c	35
UTC[11] (Pioneer 34A16)[13] + Poncho 250	— 0.25	— Seed	2.56 a	0
YGRW (DKC61-68) + Poncho 250	— 0.25	— Seed	0.39 d–g	85
UTC[11] (DKC61-72)	—	—	2.98 a	0

[1] All seed-applied insecticides and soil insecticides were applied to DKC61-72, the non-transgenic isoline of DKC61-68 YGRW, unless otherwise listed.
[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. Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).
[7] Statistical analyses were conducted on transformed data; the actual means are shown.
[8] Percentage of roots with a node-injury rating <1.0.
[9] Aztec 2.1G was applied at 8 oz as experimental use only. *Aztec 2.1G is not labeled at this rate of application.* We do not condone the use of rates of application not indicated on the product label.
[10] Applied with modified SmartBox metering units.
[11] UTC = untreated check.
[12] Mycogen 2784 is the non-transgenic isoline of HxRW Mycogen 2G777 and HxXTRA 2P788.
[13] Pioneer 34A16 is the non-transgenic isoline of Pioneer 34A18 HxXTRA.

TABLE 1.5 • Evaluation of products for late-season control of corn rootworm larvae, Monmouth, University of Illinois, 8 August, 2006

Product[1]	Rate[2,3]	Placement[2,3]	Mean node-injury rating[4,5,6]	% consistency[7]
Aztec 2.1G	6.7	Band	0.41 c	95
HxXTRA (Pioneer 34A18) + Poncho 250	— 0.25	— Seed	0.52 c	80
Poncho 1250	1.25	Seed	1.72 b	5
YGRW (DKC61-68) + Poncho 250	— 0.25	— Seed	0.59 c	80
UTC[8] (DKC61-72)	—	—	2.82 a	0

[1] All seed-applied insecticides and soil insecticides were applied to DKC61-72, the non-transgenic isoline of DKC61-68 YGRW, unless otherwise listed.
[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] Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).
[7] Percentage of roots with a node-injury rating <1.0.
[8] UTC = untreated check.

Summary of 2006 Results

Rootworm larval injury was severe at three (DeKalb, Monmouth, and Urbana) of the four trials in 2006. At these three sites, most of the granular soil insecticides provide adequate protection against corn rootworm larvae. Insecticidal seed treatments and liquid insecticides did not provide adequate protection against rootworm larvae, consistent with data we have generated in the past. The combination of Aztec 2.1G and either Poncho 250 or 1250 did not provide significantly better protection against rootworm larvae than Aztec 2.1G used alone.

Although Herculex RW and Herculex XTRA hybrids (Mycogen and Pioneer) had significantly lower node-injury ratings and performed more consistently than YGRW corn at the Urbana location, noticeable root pruning was observed (approximately ½ node) on Herculex RW and Herculex XTRA hybrids. The type of rootworm injury and root response of the Herculex hybrids were unique and contrasted with the injury that we have observed on YGRW hybrids. The Herculex hybrids had multiple noticeable feeding scars on the primary roots, which seemed to have stopped growing. Many secondary roots grew from the stubby primary roots, giving the root systems a "bottle brush" appearance. The pruning of brace roots on YGRW hybrids (especially in August) has been well documented in University of Illinois trials, specifically at the Urbana location. The trend for significant pruning of brace roots on the YGRW hybrid continued in 2006.

TABLE 1.6 • Evaluation of products to control corn rootworm larvae, Perry, University of Illinois, 18 July, 2006

Product[1]	Rate[2,3]	Placement	Mean node-injury rating[4,5,6,7]	% consistency[8]
Aztec 2.1G	6.7	Band	0.27 b-e	95
Aztec 2.1G[9]	8	Band	0.10 def	100
Aztec 2.1G + Poncho 250	6.7 0.25	Band Seed	0.08 def	100
Aztec 2.1G + Poncho 1250	4 1.25	Band Seed	0.06 ef	100
Aztec 4.67G[10]	3	Furrow	0.08 def	100
Capture LFR	8.5	Furrow	0.49 ab	79
Force 3G	4	Band	0.31 a–d	95
Fortress 2.5G	8	Furrow	0.14 c–f	100
Fortress 5G[10]	4	Furrow	0.15 c–f	100
Lorsban 15G	8	Band	0.11 c–f	100
Poncho 1250	1.25	Seed	0.09 def	100
HxXTRA (Pioneer 34A18) + Poncho 250	— 0.25	— Seed	0.04 ef	100
Pioneer 34A16[11] + Force 3G + Poncho 250	— 4 0.25	— Band Seed	0.19 b–e	100
UTC[12] (Pioneer 34A16)[11] + Poncho 250	— 0.25	— Seed	0.49 a	90
YGRW (DKC61-68) + Poncho 250	— 0.25	— Seed	0.01 f	100
UTC[12] (DKC61-72)	—	—	0.41 abc	80

1 All seed-applied and soil insecticides were applied to DKC61-72, the non-transgenic isoline of DKC61-68 YGRW, unless otherwise listed.
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. Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
7 Statistical analyses were conducted on transformed data; the actual means are shown.
8 Percentage of roots with a node-injury rating <1.0.
9 Aztec 2.1G was applied at 8 oz as experimental use only. *Aztec 2.1G is not labeled at this rate of application.* We do not condone the use of rates of application not indicated on the product label.
10 Applied with modified SmartBox metering units.
11 Pioneer 34A16 is the non-transgenic isoline of Pioneer 34A18 HxXTRA.
12 UTC = untreated check.

TABLE 1.7 • Evaluation of products to control corn rootworm larvae, Urbana, University of Illinois, 17 July, 2006

Product[1]	Rate[2,3]	Placement[2,3]	Mean node-injury rating[4,5,6,7]	% consistency[8]
Aztec 2.1G	6.7	Band	0.68 fgh	70
Aztec 2.1G[9]	8	Band	0.55 gh	95
Aztec 2.1G + Poncho 250	6.7 0.25	Band Seed	0.57 gh	90
Aztec 2.1G + Poncho 1250	4 1.25	Band Seed	0.53 gh	90
Aztec 4.67G[10]	3	Furrow	0.65 gh	80
Force 3G	4	Band	1.01 e	50
Fortress 2.5G	8	Furrow	0.54 gh	95
Fortress 5G[10]	4	Furrow	0.55 gh	85
Lorsban 15G	8	Band	0.63 gh	75
Poncho 1250	1.25	Seed	1.97 cd	0
V-10112 1.77 SC	1.25	Seed	2.97 a	0
V-10112 1.77 SC	1.5	Seed	2.52 ab	0
V-10170 2.32 SC	1.25	Seed	1.92 cd	0
V-10194	1.25	Seed	2.17 bcd	0
V-10194	1.5	Seed	1.81 d	5
HxRW (Mycogen 2G777) + Cruiser 250	— 0.25	— Seed	0.55 gh	85
HxXTRA (Mycogen 2P788) + Cruiser 250	— 0.25	— Seed	0.44 h	90
UTC[11] (Mycogen 2784)[12]	—	—	2.94 a	0
HxXTRA (Pioneer 34A18) + Poncho 250	— 0.25	— Seed	0.47 h	85
Pioneer 34A16[13] + Force 3G + Poncho 250	— 4 0.25	— Band Seed	0.77 efg	70
UTC[11] (Pioneer 34A16)[13] + Poncho 250	— 0.25	— Seed	2.43 abc	0
YGRW (DKC61-68) + Poncho 250	— 0.25	— Seed	0.96 ef	35
UTC[11] (DKC61-72)	—	—	2.95 a	0

[1] All seed-applied and soil insecticides were applied to DKC61-72, the non-transgenic isoline of DKC61-68 YGRW, unless otherwise listed.
[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. Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[7] Statistical analyses were conducted on transformed data; the actual means are shown.
[8] Percentage of roots with a node-injury rating <1.0.
[9] Aztec 2.1G was applied at 8 oz as experimental use only. *Aztec 2.1G is not labeled at this rate of application.* We do not condone the use of rates of application not indicated on the product label.
[10] Applied with modified SmartBox metering units.
[11] Mycogen 2784 is the non-transgenic isoline of HxRW Mycogen 2G777 and HxXTRA 2P788.
[12] UTC = untreated check.
[13] Pioneer 34A16 is the non-transgenic isoline of Pioneer 34A18 HxXTRA.

TABLE 1.8 • **Evaluation of products for late-season control of corn rootworm larvae, Urbana, University of Illinois, 7 August, 2006**

Product[1]	Rate[2,3]	Placement	Mean node-injury rating[4,5,6]	% consistency[7]
Aztec 2.1G	6.7	Band	0.63 d	80
HxXTRA (Pioneer 34A18) + Poncho 250	— 0.25	— Seed	0.37 d	95
Poncho 1250	1.25	Seed	2.35 b	0
YGRW (DKC61-68) + Poncho 250	— 0.25	— Seed	1.46 c	0
UTC[8] (DKC61-72)	—	—	3.00 a	0

[1] All seed-applied and soil insecticides were applied to DKC61-72, the non-transgenic isoline of DKC61-68 YGRW, unless otherwise listed.
[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] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[7] Percentage of roots with a node-injury rating <1.0.
[8] UTC = untreated check.

SECTION 2

Comparison of YieldGard RW hybrids to control corn rootworm larvae *(Diabrotica spp.)* in Illinois, 2006

Michael E. Gray, Ronald E. Estes, Jared B. Schroeder, and Kevin L. Steffey

Background

In 2005, we evaluated eight YieldGard RW hybrids for efficacy against corn rootworm larvae in a trial located near Urbana. Based on the results from this experiment, we concluded that different transgenic Bt corn hybrids provided different levels of protection against rootworm larvae. In 2006, we expanded the experiment to include 10 YieldGard RW hybrids and planted them in two locations, Monmouth and Urbana. We added the Monmouth location to gather more data regarding our hypothesis about the ability of the variant western corn rootworm to inflict more root injury on YieldGard RW hybrids. The variant western corn rootworm is well established in the Urbana area, but is less well established in the Monmouth area. In all trials in both years, we also planted a check hybrid (non-Bt) and two YieldGard RW hybrids that had failed to meet Monsanto's commercialization standards. During both years, we were not informed about the genetic backgrounds nor provided with the names of the hybrids, so different treatments were labeled simply with letters of the alphabet, A through K in 2006. After we had evaluated all root systems for rootworm larval injury in 2006, we were informed by Monsanto personnel that hybrid B was the non-Bt hybrid and hybrids D and F (both YieldGard RW hybrids) had failed to meet Monsanto's commercialization standards.

Location

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

Experimental Design and Methods

The experimental design was a randomized complete block with four replications. The plot size for each treatment was 10 ft (four rows) x 30 ft. Ten randomly selected root systems were extracted from the center two rows of each plot on each of two dates at each location—24 July and 8 August (Monmouth), 20 July and 7 August (Urbana). The root systems were washed and then rated for corn rootworm larval injury using the 0 to 3 node-injury scale developed by Oleson et al. (2005) (Appendix I). Percentage consistency (percentage of roots with a rating less than 1.0) also was determined for each hybrid on both dates at each location.

Planting and Insecticide Application

The trials were planted on 4 and 5 May, 2006, in Monmouth and Urbana, respectively. Both trials were planted using a four-row, Almaco constructed planter with John Deere 7300 row units. Precision cone units were used.

Agronomic Information

Agronomic information is listed in Table 2.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix II.

TABLE 2.1 • Agronomic information for efficacy trials of YieldGard Rootworm (YGRW) hybrids to control corn rootworm larvae, Monmouth and Urbana, University of Illinois, 2006

	Monmouth	**Urbana**
Planting date	4 May	5 May
Root evaluation dates	24 July—1st evaluation 8 August—2nd evaluation	20 July—1st evaluation 7 August—2nd evaluation
Row spacing	30 inches	30 inches
Seeding rate	33,000/acre	33,000/acre
Previous crop	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

TABLE 2.2 • **Evaluation of YieldGard RW corn hybrids for control of corn rootworm larvae, Monmouth, University of Illinois, 2006**

Hybrid[1]	24 July		8 August	
	Mean node-injury rating[2,3,4,5]	% consistency[6]	Mean node-injury rating[2,3,4,5]	% consistency[6]
Hybrid A	0.19 de	100	0.34 e	93
Hybrid B	2.63 a	0	2.74 a	0
Hybrid C	0.06 e	100	0.22 e	98
Hybrid D	0.76 c	53	1.09 c	41
Hybrid E	0.20 de	90	0.42 e	90
Hybrid F	1.00 b	35	1.44 b	18
Hybrid G	0.16 de	95	0.38 e	90
Hybrid H	0.22 de	88	0.41 e	82
Hybrid I	0.11 de	100	0.23 e	98
Hybrid J	0.15 de	95	0.45 e	83
Hybrid K	0.30 d	98	0.75 d	65

[1] All hybrids (A–K) were provided by Monsanto Company. The names of the hybrids were not known to University of Illinois personnel and are identified only by letter.
[2] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005).
[3] Mean node-injury ratings were derived from 10 root systems per treatment in each of four replications.
[4] Data were transformed (Log [root rating + 1]) for analysis. Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[5] Statistical analyses were conducted on transformed data; the actual means are shown.
[6] Percentage of roots with a node-injury rating <1.0.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.0.5. (Copyright© 1982–2003 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Monmouth—The level of rootworm injury to the check (non-Bt) hybrid was severe, with a mean node-injury rating of 2.63 on 24 July and 2.74 on 8 August (Table 2.2). The mean node-injury ratings for the commercialized YieldGard RW hybrids (A, C, E, G, H, I, J, and K) were very low on 24 July (range of 0.06 to 0.30), indicating excellent root protection under heavy rootworm larval feeding pressure. Although the level of rootworm larval injury to all commercialized YieldGard RW hybrids increased from 24 July to 8 August, the mean node-injury ratings for most of them were relatively low (approximately ⅓ to ½ node of roots pruned). The exception was Hybrid K, which had mean node-injury rating of 0.75, significantly greater than the mean node-injury ratings for all other commercialized YieldGard RW hybrids. Hybrid K was only 65% consistent on 8 August.

The two YieldGard RW hybrids that were not commercialized, D and F, had root ratings of 0.76 and 1.00, respectively on 24 July, and 1.09 and 1.44, respectively, on 8 August. These mean node-injury ratings were significantly greater than the mean node-injury ratings of the commercialized YieldGard RW hybrids but significantly lower than the mean node-injury ratings in the untreated check on both dates of evaluation.

Urbana—The level of rootworm injury to the check (non-Bt) hybrid was severe, with a mean node-injury rating of 2.52 on 20 July and 2.68 on 7 August (Table 2.3), similar to the level of rootworm injury at Monmouth (Table 2.2). The mean node-injury ratings for the commercialized YieldGard RW hybrids (A, C, E, G, H, I, J, and K) were relatively low on 20 July (range of 0.14 to 0.41), although greater than the mean node-injury ratings for the same hybrids at Monmouth (Table 2.2). The level of rootworm larval injury to all commercialized YieldGard RW hybrids increased noticeably from 20 July to 7 August, with a range of mean node-injury ratings from 0.62 to 0.91 (2/3 to almost 1 node of roots destroyed). Percentage consistency among the commercialized YieldGard RW hybrids were considerably lower on 7 August than they were on 20 July, ranging from 54 to 83%.

TABLE 2.3 • Evaluation of YieldGard RW hybrids for control of corn rootworm larvae, Urbana, University of Illinois, 2006

Hybrid[1]	20 July		7 August	
	Mean node-injury rating[2,3,4,5]	% consistency[6]	Mean node-injury rating[2,3,4,5]	% consistency[6]
Hybrid A	0.39 d	88	0.86 c	54
Hybrid B	2.52 a	0	2.68 a	0
Hybrid C	0.24 d	95	0.62 d	83
Hybrid D	0.79 c	48	1.50 b	10
Hybrid E	0.29 d	93	0.89 c	58
Hybrid F	1.21 b	10	1.92 b	0
Hybrid G	0.34 d	95	0.83 c	63
Hybrid H	0.36 d	88	0.83 c	65
Hybrid I	0.41 d	87	0.79 c	60
Hybrid J	0.14 d	100	0.66 c	75
Hybrid K	0.36 d	90	0.91 c	55

[1] All hybrids (A–K) were provided by Monsanto Company. The names of the hybrids were not known to University of Illinois personnel and are identified only by letter.
[2] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005).
[3] Mean node-injury ratings were derived from 10 root systems per treatment in each of four replications.
[4] Data were transformed (Log [root rating + 1]) for analysis. Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[5] Statistical analyses were conducted on transformed data; the actual means are shown.
[6] Percentage of roots with a node-injury rating <1.0.

The two YieldGard RW hybrids that were not commercialized, D and F, had root ratings of 0.79 and 1.21, respectively on 20 July, and 1.50 and 1.92, respectively, on 7 August. These mean node-injury ratings were significantly greater than the mean node-injury ratings of the commercialized YieldGard RW hybrids but significantly lower than the mean node-injury ratings in the untreated check on both dates of evaluation.

By the second date of root evaluations at both sites, the percentage consistency of every YieldGard RW hybrid (both commercialized and noncommercialized) was lower in the Urbana experiment than in the Monmouth experiment. The reductions in percentage consistency between these two experiments for the different hybrids were:

- Hybrid A, 39%
- Hybrid C, 15%
- Hybrid D, 31%
- Hybrid E, 32%
- Hybrid F, 18%
- Hybrid G, 27%
- Hybrid H, 17%
- Hybrid I, 38%
- Hybrid J, 8%
- Hybrid K, 10%

For most of these hybrids, the differences in percentage consistency on the first root evaluation dates were not as noticeable.

Summary

Differences in levels of rootworm larval injury were observed among YieldGard RW hybrids at both the Monmouth and Urbana locations. The overall severity of rootworm injury to commercialized YieldGard RW hybrids was greater in the Urbana experiment than in the Monmouth experiment. However, by the second evaluation date, even at the Monmouth site, several of the YieldGard RW hybrids had noticeable root pruning (1/3 to 1/2 node). Percentage consistencies for all YieldGard RW hybrids were greater in the Monmouth experiment than in the Urbana experiment. Bt protein expression declines in some hybrids throughout the growing season (Vaughn et al. 2005, Appendix I). For some YieldGard RW hybrids, this decline may result in inadequate root protection late in the season. Excessive late-season brace-root pruning may contribute to lodging and subsequent difficulties with harvest operations.

Our data seem to support the hypothesis that populations of the variant western corn rootworm may be more injurious to some YieldGard RW hybrids than nonvariant populations. As indicated previously, the variant western corn rootworm is well established in east central Illinois and not as well established in western Illinois. Further investigations are needed to confirm our hypothesis. Eventually, it will be necessary to separate variant from nonvariant western corn rootworms, then subject transgenic corn rootworm hybrids to precise infestation levels of both populations and evaluate root injury and adult emergence across the treatments.

SECTION 3

Comparison of Herculex Rootworm (HxRW) hybrids to control corn rootworm larvae *(Diabrotica spp.)* in Illinois, 2006

Michael E. Gray, Ronald E. Estes, Jared B. Schroeder, and Kevin L. Steffey

Location

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

Experimental Design and Methods

With the cooperation of Dow AgroSciences and Pioneer Hi-Bred International, we evaluated the efficacy of six Herculex Rootworm (HxRW) hybrids against corn rootworm larvae. All hybrids were selected by Dow AgroSciences and Pioneer Hi-Bred International; we were not informed about the genetic backgrounds nor provided with the names of the hybrids. Treatments were labeled only with the company name and a letter of the alphabet—A, B, or C for the three hybrids provided by each company. One hybrid from each company was considered a check (non-Bt).

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. Six randomly selected root systems were extracted from the center two rows of each plot on each of two dates, 19 July and 7 August. The root systems were washed and then rated for corn rootworm larval injury using the 0 to 3 node-injury scale developed by Oleson et al. (2005) (Appendix I). Percentage consistency (percentage of roots with a rating less than 1.0) also was determined for each hybrid on both dates.

Planting and Insecticide Application

The trial was planted on 23 May using a four-row, Almaco constructed planter with John Deere 7300 row units. Precision cone units were used.

Agronomic Information

Agronomic information is listed in Table 3.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix II.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.0.5. (Copyright© 1982–2003 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

The level of rootworm injury to the check (non-Bt) hybrids was severe, with mean node-injury ratings of 2.90 (Dow hybrid C) and 2.58 (Pioneer hybrid C) on 19 July and 2.94 (Dow hybrid C) and 2.90 (Pioneer hybrid C) on 7 August (Table 3.2). The mean node-injury ratings of the HxRW hybrids (Dow A and B, Pioneer A and B) were extremely low and significantly lower than the mean node-injury ratings of the check hybrids. Percentage consistency for the HxRW hybrids was 100% on 19 July.

The mean node-injury ratings for all HxRW hybrids increased, at least slightly, between 19 July and 7 August (Table 3.2), but these increases were most likely not biologically significant. The most noticeable increase (from 0.17 to 0.42) occurred with Dow hybrid B, with 88% consistency on 7 August. The increases in mean node-injury ratings for the three other HxRW hybrids were slight, with 100% consistency on 7 August.

Although the level of root pruning of the Herculex RW hybrids was negligible, scarring and tunneling on the root systems were apparent. On some plants, feeding by rootworm

TABLE 3.1 • Agronomic information for efficacy trial of Herculex Rootworm (HxRW) hybrids to control corn rootworm larvae, Urbana, University of Illinois, 2006

Planting date	23 May
Root evaluation dates	19 July—1st evaluation 7 August—2nd evaluation
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

larvae seemed to have "pinched off" root growth. Secondary root development in the HxRW hybrids was prolific, possibly as a result of the scarring and tunneling we observed. Because of the excessive growth of secondary roots, the root systems extracted from this experiment were not easy to rate for rootworm larval injury. An alternative methodology to evaluate rootworm injury to rootworm Bt corn is worthy of discussion by entomologists who work in this research area.

TABLE 3.2 • Evaluation of Herculex RW (HxRW) hybrids for control of corn rootworm larvae, Urbana, University of Illinois, 2006

Hybrid[1]	19 July		7 August	
	Mean node-injury rating[2,3,4,5]	% consistency[6]	Mean node-injury rating[2,3,4,5]	% consistency[6]
Dow hybrid A	0.09 cd	100	0.18 bc	100
Dow hybrid B	0.17 c	100	0.42 b	88
Dow hybrid C	2.90 a	0	2.94 a	0
Pioneer hybrid A	0.06 d	100	0.18 bc	100
Pioneer hybrid B	0.07 d	100	0.14 c	100
Pioneer hybrid C	2.58 b	4	2.90 a	0

[1] Three HxRW hybrids (A–C) were provided by both Dow AgroSciences and Pioneer. The names of the hybrids were not known to University of Illinois personnel and are identified only by letter.
[2] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005).
[3] Mean node-injury ratings were derived from six root systems per treatment in each of four replications.
[4] Data were transformed (arcsine square root) for analysis. Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).
[5] Statistical analyses were conducted on transformed data; the actual means are shown.
[6] Percentage of roots with a node-injury rating <1.0.

SECTION 4

Evaluation of liquid Force to control corn rootworm larvae *(Diabrotica spp.)* in Illinois, 2006

Ronald E. Estes, Jared B. Schroeder, Kevin L. Steffey, and Michael E. Gray

Location

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

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. Six randomly selected root systems were extracted from the first row of each plot on 19 July. The root systems were washed and then rated for corn rootworm larval injury using the 0 to 3 node-injury scale developed by Oleson et al. (2005) (Appendix I). Percentage consistency (percentage of roots with a rating less than 1.0) was determined for each product.

Planting and Insecticide Application

The corn hybrid used for the study was DKC61-72. The trial was planted on 6 May 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 slope-compensating bander (5-inches) 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.

Agronomic Information

Agronomic information is listed in Table 4.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix II.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.0.5. (Copyright© 1982–2003 Gylling Data Management, Inc., Brookings, SD.).

Results and Discussion

The mean node-injury rating, percentage consistency, and yield for each treatment are provided in Table 4.2. The mean node-injury rating in the untreated check was 2.77, indicating that corn rootworm larval feeding injury was severe. Differences in the levels of protection against rootworm larval injury were apparent among treatments.

In general, the root ratings among the Force 2.25SC treatments did not show a strong response to the rate of application. However, placement seemed to have some impact on the performance of Force 2.25SC. The mean node-injury ratings for the band placements of Force 2.25CS were lower than the mean node-injury ratings for the in-furrow placements of equivalent rates, although the difference was significant only for the 0.46 oz rate.

Force 2.25SC provided essentially the same level of protection as Force 3G against rootworm larval injury. The only exception occurred in plots treated with the 0.46 oz rate of Force 2.25CS, which had a significantly greater node-injury rating than plots treated with Force 3G in a band.

The mean node-injury rating for Aztec 2.1G applied in a band was significantly lower than the mean node-injury ratings for all Force 2.25CS treatments except for the 0.58 rate applied in a band. The mean node-injury ratings of Aztec 2.1G applied in furrow was not significantly different from the mean node-injury ratings for all rates of Force 2.25CS applied in a band.

TABLE 4.1 • Agronomic information for efficacy trial of liquid Force (Force 2.25CS) to control corn rootworm larvae, Urbana, University of Illinois, 2006

Planting date	6 May
Root evaluation date	19 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

The mean node-injury rating for Capture LFR applied in furrow was significantly greater than the mean node-injury ratings of all other products in the trial except Regent 4SC. The mean node-injury rating for Regent 4SC did not differ significantly from the mean-node injury rating in the untreated check. Regent has not performed well in our corn rootworm efficacy experiments for many years.

Yields ranged from 36.74 bushels per acre (untreated check) to 159.42 bushels per acre (Aztec 2.1G applied in furrow).

Yields of all of the insecticide treatments were significantly greater than yields of the untreated check. The mean yields for Aztec (band and furrow), Force 3G (band and furrow), and Force 2.25CS (all rates in a band and in furrow, except for the 0.58 rate applied in a band) were statistically equivalent. The mean yields for Capture LFR (band and furrow), Force 2.25CS applied at 0.58 oz in a band, and Regent 4SC were statistically equivalent.

TABLE 4.2 • Evaluation of liquid Force (Force 2.25CS) for control of corn rootworm larvae, Urbana, University of Illinois, 2006

Product	Rate[1,2]	Placement	Mean node-injury rating[3,4,5]	Percentage consistency	Yield (bu/A)[6]
Aztec 2.1G	6.7	Band	0.34 g	95	142.22 a–d
Aztec 2.1G	6.7	Furrow	0.41 fg	100	159.42 a
Capture LFR	0.3	Band	1.50 c	5	129.17 b–e
Capture LFR	0.3	Furrow	2.16 b	5	124.52 de
Force 3G	4.0	Band	0.62 efg	75	143.73 a–d
Force 3G	4.0	Furrow	0.90 de	45	143.35 a–d
Force 2.25CS	0.35	Band	0.80 ef	56	150.47 abc
Force 2.25CS	0.35	Furrow	1.08 de	50	151.76 ab
Force 2.25CS	0.46	Band	0.82 ef	56	140.90 a–d
Force 2.25CS	0.46	Furrow	1.32 cd	25	147.99 a–d
Force 2.25CS	0.58	Band	0.75 efg	67	126.51 cde
Force 2.25CS	0.58	Furrow	0.97 de	50	143.42 a–d
Regent 4SC	0.24	Furrow	2.74 a	0	108.83 e
Untreated check	—	—	2.77 a	5	36.74 f

[1] Rates of application for granular insecticides are ounces (oz) of product per 1,000 ft of row.
[2] Rates of application for liquid insecticides are fluid ounces (fl oz) of product per 1,000 ft of row.
[3] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
[4] Mean node-injury ratings were derived from six root systems per treatment in each of four replications.
[5] Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).
[6] Yield samples were machine harvested from 30 ft of row and converted to bushels per acre at 15% moisture.

SECTION 5

Evaluation of transgenic corn pest management systems: From weeds to corn rootworms, 2006

Ronald E. Estes, Jared B. Schroeder, Kevin L. Steffey, and Michael E. Gray

Objective

The objective of this experiment was to determine the effects of different combinations of transgenic traits, soil insecticides, seed-applied insecticides, and herbicides on various parameters of corn that ultimately contribute to yield. Plots with DeKalb and Pioneer corn hybrids with and without different transgenic traits were treated with different combinations of herbicides. Hybrids without rootworm Bt traits were treated with either a soil insecticide (Force 3G) or Poncho 1250 for protection against corn rootworm larvae, or were not protected against corn rootworm larvae (i.e., no soil insecticide, Poncho 250).

The corn hybrids included in the trial were YieldGard VT Rootworm/RR2 (hybrid name not known), DKC61-68 (RR2/YGRW), DKC61-72 (RR2), Pioneer 34A19 (HXRW/LL), and Pioneer 34A15.

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 30 ft. Stand counts were taken from 17.5 ft of row on 22 June and then converted to number of plants per acre. Five randomly selected root systems were extracted from the first row of each plot on 20 July. The root systems were washed and then rated for corn rootworm larval injury using the 0 to3 node-injury scale developed by Oleson et al. (2005) (Appendix I). Percentage consistency (percentage of roots with a rating less than 1.0) was determined for each treatment.

Percentage weed control in each plot was assessed by visual observations on 24 August.

Percentage root lodging (percentage of plants ≥ 45 degrees from vertical in 17.5 ft of row) was assessed in row two of each treatment on 24 August and 24 October. On 9 October, 10 randomly selected ears were collected from row two in each plot. The ears were then shelled and weighed.

Planting and Insecticide and Herbicide Applications

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 planter row. Plastic tubes directed the insecticide granules to a 5-inch, slope-compensating bander. 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 the incorporation of the soil insecticides. Preemergence herbicides were applied post-planting on 22 May, and Roundup was applied post-emergence to the appropriate plots on 26 June. All herbicides were applied with a CO_2 backpack sprayer and a 10-ft spray boom. TeeJet brand AI 110015VS spray nozzles were calibrated to deliver a volume of 15 gal per acre.

Agronomic Information

Agronomic information is listed in Table 5.1.

Climatic Conditions

Precipitation data are presented in Appendix II.

TABLE 5.1 • Agronomic information for the experiment comparing transgenic corn pest management systems, Urbana, University of Illinois, 2006

Planting date	22 May
Root evaluation date	20 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 5.2 • **Evaluation of transgenic corn pest management systems, Urbana, University of Illinois, 2006**

Product	Rate	Rate unit	Placement	Mean stand count (plants/A)[1]
YGVT Rootworm/RR2 + Poncho 250 + Harness Xtra 5.6 + Roundup Omax	— 0.25 1.5 22	— mg a.i./seed qt/A fl oz/A	— Seed BC[2] Preemergence BC[2] Postemergence	26,000 a
RR2/YGRW (DKC61-68) + Poncho 250 + Harness Xtra 5.6 + Roundup Omax	— 0.25 1.5 22	— mg a.i./seed qt/A fl oz/A	— Seed BC[2] Preemergence BC[2] Postemergence	25,750 a
RR2 (DKC61-72) + Poncho 250 + Force 3G + Harness Xtra 5.6 + Roundup Omax	— 0.25 4 1.5 22	— mg a.i./seed oz/1,000 ft row qt/A fl oz/A	— Seed Band BC[2] Preemergence BC[2] Postemergence	25,750 a
RR2 (DKC61-72) + Poncho 1250 + Harness Xtra + Roundup Omax	— 1.25 1.5 22	— mg a.i./seed qt/A fl oz/A	— Seed BC[2] Preemergence BC[2] Postemergence	25,500 a
RR2 (DKC 61-72) + Poncho 250 + Harness Xtra + Roundup Omax	— 0.25 1.5 22	— mg a.i./seed qt/A fl oz/A	— Seed BC[2] Preemergence BC[2] Postemergence	23,250 ab
HXRW/LL (Pioneer 34A19) + Lumax	— 3	— qt/A	— BC[2] Preemergence	24,500 a
Pioneer 34A15 + Force 3G + Lumax	— 4 3	— oz/1,000 ft row qt/A	— Band BC[2] Preemergence	19,500 b
Pioneer 34A15 + Poncho 1250 + Lumax	— 1.25 3	— mg a.i./seed qt/A	— Seed BC[2] Preemergence	22,750 ab

[1] Stand counts are based on the number of plants per 17.5 ft of row (1/1,000 acre).
[2] BC = Broadcast.

TABLE 5.3 • **Evaluation of transgenic corn pest management systems, Urbana, University of Illinois, 2006**

Product[1]	Mean node-injury rating[2,3,4,5]	% consistency[6]	% lodging[4]		% weed control[4] 24 Aug	Mean weight (lb) 10 shelled ears[4] 9 Oct
			8 June	24 Oct		
YGVT Rootworm/RR2 + Poncho 250 + Harness Xtra 5.6 + Roundup Omax	0.06 c	100	2 d	1 c	98.00 a	4.49 ab
RR2/YGRW (DKC61-68) + Poncho 250 + Harness Xtra 5.6 + Roundup Omax	0.49 b	85	56 a	61 a	94.00 a	4.40 ab
RR2 (DKC61-72) + Poncho 250 + Force 3G + Harness Xtra 5.6 + Roundup Omax	0.51 b	90	0 d	0 c	98.50 a	3.55 bc
RR2 (DKC61-72) + Poncho 1250 + Harness Xtra + Roundup Omax	0.52 b	80	6 cd	5 bc	95.00 a	3.54 bc
RR2 (DKC61-72) + Poncho 250 + Harness Xtra + Roundup Omax	1.74 a	15	26 bc	38 ab	85.50 a	2.99 c
HXRW/LL (Pioneer 34A19) + Lumax	0.09 c	100	0 d	9 bc	97.00 a	4.62 a
Pioneer 34A15 + Force 3G + Lumax	0.31 b	100	0 d	0 c	94.25 a	3.58 bc
Pioneer 34A15 + Poncho 1250 + Lumax	1.23 a	40	37 ab	54 a	84.75 a	2.83 c

[1] Rates of application for all treatments are listed in Table 5.3.
[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] Statistical analyses were conducted on transformed data; the actual means are shown.
[6] Percentage of roots with a node-injury rating <1.0.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.0.5. (Copyright© 1982–2003 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

For ease of discussion, the treatments typically are referred to in abbreviated fashion as follows:

- YGVT = YieldGard VT Rootworm/RR2
- RR2/YGRW (DKC61-68)
- RR2 + Force (DKC61-72)
- RR2 + Poncho 1250 (DKC61-72)
- RR2 (DKC61-72)
- HXRW/LL (Pioneer 34A19)
- Pioneer 34A15 + Force
- Pioneer 34A15

The mean stand counts for the various treatments are presented in Table 5.2. The mean stand counts (plants/A) of seven of the eight treatments were not significantly different.

The mean stand count of Pioneer 34A15 + Force was significantly lower than the mean stand counts for YGVT, RR2/YGRW, RR2 + Force, RR2 + Poncho 1250, and HXRW/LL. The cause for the lower stand count was not determined.

Mean node-injury ratings, percentage consistencies, percentage lodging, percentage weed control, and the mean weights of 10 shelled ears are presented in Table 5.3. The mean node-injury ratings for the "checks" (i.e., no protection against corn rootworm larvae) were 1.74 (RR2) and 1.23 (Pioneer 34A15) and not statistically different, indicating that rootworm larval feeding injury was moderate to severe in this experiment. The mean node-injury ratings for all other treatments were significantly lower than the mean node-injury ratings for the checks. The mean node-injury ratings for YGVT and HXRW/LL were significantly lower than the mean-node injury ratings for all other treatments and were not statistically different from each other.

Percentage consistency among treatments ranged from 15 to 100%. YGVT, HXRW/LL, and Pioneer 34A15 + Force were 100% consistent.

On 8 June, percentage lodging ranged from 0 to 37%, and on 24 August, percentage lodging ranged from 0 to 61%. Five treatments had less than 10% lodging on both dates, with no significant differences among the five treatments. Two of these five treatments (the two treatments with Force 3G applied to protect the roots against corn rootworm larvae) had no lodging on both dates. On 24 August, RR2/YGRW and Pioneer 34A15 had significantly more lodging than all treatments except RR2.

Percentage weed control assessed on 24 August did not differ significantly among treatments.

The mean weights of 10 shelled ears ranged from 2.83 to 4.62 pounds. These weights for most treatments were not statistically different. However, the mean weights of 10 ears in the three hybrids with rootworm Bt traits (YGVT, RR2/YGRW, and HXRW/LL) were significantly greater than the mean weights of 10 ears in the checks (RR2, Pioneer 34A15). These data suggest that in this experiment among the parameters measured, rootworm larval injury was the most significant contributor to yield loss.

SECTION 6

Evaluation of Agrisure RW (event MIR 604) to control corn rootworm larvae *(Diabrotica spp.)* in Illinois, 2006

Ronald E. Estes, Jared B. Schroeder, 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 17.5 ft. Five randomly selected root systems were extracted from the first row of each plot on 17 July. The root systems were washed and then rated for rootworm larval injury using the 0 to 3 node-injury scale developed by Oleson et al. (2005) (Appendix I). Percentage consistency (percentage of roots with a rating less than 1.0) also was determined for each treatment.

Planting and Insecticide Application

The trial was planted on 23 May using a four-row, Almaco constructed planter with John Deere 7300 row units. This planting date was later than optimum and may have influenced the results. Precision cone units were used to plant the seeds. Granular insecticides were applied through modified Noble metering units mounted to each row. Plastic tubes directed the insecticide granules to a 5-in, slope-compensating bander. Cable-mounted tines were attached behind each of the row units to improve insecticide incorporation.

Agronomic Information

Agronomic information is listed in Table 6.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix II.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.0.5. (Copyright© 1982–2003 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Corn rootworm larval injury in the untreated check was severe, with a mean node-injury rating of 3.0 (Table 6.2). The mean-node injury ratings for all other treatments in the trial were significantly lower than the mean node-injury rating in the untreated check. The mean node-injury rating for Aztec 2.1G was significantly lower than the mean node-injury ratings for all other treatments except Lorsban 15G. The mean node-injury ratings for Force 3G, Agrisure RW, Agrisure RW + Cruiser 5FS, and Poncho 1250 ranged from 0.94 to 1.33 and were statistically equivalent, with nearly 1 to 1 1/3 nodes pruned. The mean node-injury rating for Cruiser 5FS was significantly greater than the mean node-injury ratings for all other rootworm control products except Agrisure RW + Cruiser 5FS. Percentage consistency reflected the mean node-injury ratings for each product, with 100% consistency for Aztec 2.1G, 90% consistency for Lorsban 15G, 60% consistency for Force 3G, and 40% consistency for Agrisure RW. Poncho 1250 and Cruiser 5FS were 40 and 10% consistent, respectively.

In this experiment, the granular soil insecticides Aztec 2.1G and Lorsban 15G provided better protection of roots from corn rootworm larvae than the seed applied insecticides and the transgenic Bt corn hybrid (Agrisure RW), with or without Cruiser. Both of the Agrisure RW hybrids had more than 1 node of roots pruned. The level of injury to the Agrisure RW hybrids in our experiment was greater than most producers expect from a rootworm Bt corn hybrid. Additional experiments are necessary to determine consistency of performance of Agrisure RW hybrids over time and in other locations.

TABLE 6.1 • Agronomic factors for evaluation of Agrisure RW (MIR 604) for control of corn rootworm larvae, Urbana, University of Illinois, 2006

Planting date	23 May
Root evaluation date	17 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 6.2 • Evaluation of Agrisure RW (MIR 604) for control of corn rootworm larvae, Urbana, University of Illinois, 2006

Product	Rate[1,2]	Placement	Mean node-injury rating[3,4,5,6]	% consistency[7]
Aztec 2.1G	6.7	Band	0.26 e	100
Cruiser 5FS	1.25	Seed	1.87 b	10
Force 3G	4	Band	0.94 cd	60
Lorsban 15G	8	Band	0.51 de	90
Agrisure RW (MIR 604)	—	—	1.04 c	40
Agrisure RW (MIR 604) + Cruiser 5FS	— 0.25	— Seed	1.33 bc	25
Poncho 1250	1.25	Seed	1.05 c	40
Untreated check	—	—	3.00 a	0

[1] Rates of application for granular insecticides are ounces (oz) of product per 1,000 ft of row.
[2] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[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] Statistical analyses were conducted on transformed data; the actual means are shown.
[7] Percentage of roots with a node-injury rating <1.0.

SECTION 7

Evaluation of insecticides to control Japanese beetle grubs *(Popilla japonica)* and grape colaspis larvae *(Colaspis brunnea)* in Illinois, 2006

Ronald E. Estes, Jared B. Schroeder, Kevin L. Steffey, and Michael E. Gray

Locations

We established three trials at three different locations—Agricultural Engineering Farm near Urbana (Champaign County); Michael Schroeder Farm near Gibson City (Ford County); and Richard Peters Farm near Germantown (Clinton County).

Experimental Design and Methods

The experimental design was a randomized complete block with three replications. The plot size for each treatment was 5 ft x 17.5 ft at Urbana, and 5 ft x 30 ft at all other locations. Samples were taken to determine the number of Japanese beetle grubs per meter of row in all treatments. At the Germantown site, numbers of grape colaspis larvae in each treatment also were recorded. Stand counts were taken from 17.5 ft of row (1/1,000 acre) on two different dates and converted to numbers of plants per acre. At the Urbana site, 10 randomly selected ears were hand harvested, shelled, and weighed. Due to the small size of the sample, these data were not converted to bushels per acre. At the Gibson City and Germantown sites, 17.5 ft of row (1/1,000 acre) were hand harvested, shelled, and weighed, and the data were converted to bushels per acre at 15% moisture.

Planting and Insecticide Application

The corn hybrid used for the studies was DKC61-72.Trials were planted 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. Plastic tubes directed the insecticide granules to either a 5-inch, slope-compensating bander or into the seed furrow. Regent 4SC was applied through microtubes in furrow at a spray volume of 5 gal per acre using a CO_2 system. All insecticides were applied in front of the firming wheels. Cable-mounted tines were attached behind each of the row units to improve insecticide incorporation.

Agronomic Information

Agronomic information is listed in Table 7.1.

Climatic Conditions

Precipitation data are presented in Appendix II.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.0.5. (Copyright© 1982–2003 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Mean stand counts, numbers of insects, and yields from the trials near Urbana, Gibson City, and Germantown are presented in tables 7.2, 7.3, and 7.4, respectively. Japanese beetle grubs were present in all treatments at all three locations, and grape colaspis larvae were present in all treatments at the Germantown site. At all three locations, there were few

TABLE 7.1 • Agronomic information for the efficacy trials of products to control Japanese beetle grubs and grape colaspis larvae, University of Illinois, 2006

	Urbana	Gibson City	Germantown
Planting date	26 April	26 April	30 May
Row spacing	30 inches	30 inches	30 inches
Seeding rate	33,000/acre	33,000/acre	33,000/acre
Previous crop	Soybean	Soybean	Clover

significant differences among treatments in mean stand counts (both dates of evaluation) and in mean numbers of insects per meter of row, and no trends were apparent. The statistically significant differences in yield among treatments at the Germantown site could not be attributed to differences in numbers of white grubs or grape colaspis among treatments.

Natural infestations of Japanese beetle grubs and grape colaspis larvae are difficult to predict, and infestations within fields are highly aggregated, making it difficult to provide meaningful interpretations of the data. Results from the trial near Gibson City indicate that even when densities of Japanese beetle grubs were moderate, there were no consistently explainable differences in numbers of grubs among treatments.

TABLE 7.2 • **Evaluation of products to control Japanese beetle grubs, Urbana, University of Illinois, 2006**

Product	Rate[1,2]	Placement[1,2]	Mean stand count (plants per acre)[3,4]		Mean no. grubs,[4,5] 17 May	Mean weight (lb) of 10 shelled ears,[4] 6 Oct
			10 May	24 May		
Poncho 250	0.25	Seed	28,670 a	28,330 a	2.00 a	4.67 a
Poncho 1250	1.25	Seed	27,330 a	28,000 a	4.00 a	4.18 a
Cruiser 5FS	0.25	Seed	27,670 a	25,670 ab	5.00 a	4.23 a
Cruiser 5FS	1.25	Seed	24,000 a	22,330 b	4.33 a	4.89 a
Aztec 4.67G[6]	1.50	Furrow	27,000 a	27,330 a	6.67 a	4.20 a
Force 3G	4.00	Band	28,670 a	29,000 a	3.67 a	4.01 a
Fortress 5G[6]	1.50	Furrow	28,000 a	27,670 a	2.33 a	4.04 a
Regent 4SC	0.24	Furrow	26,330 a	25,670 ab	4.00 a	4.39 a
Regent TS	0.33	Seed	26,670 a	27,330 a	4.00 a	4.42 a
Untreated check	—	—	25,000 a	22,330 b	3.33 a	4.69 a
Untreated check	—	—	27,670 a	27,670 a	4.33 a	4.19 a

[1] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[2] Rates of application for furrow placements are ounces (oz) of product per 1,000 ft of row.
[3] Stand counts are based upon the number of plants per 17.5 ft of row (1/1,000 acre).
[4] Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).
[5] Samples were taken from 1 m of row.
[6] Applied with modified SmartBox metering units.

TABLE 7.3 • **Evaluation of products to control Japanese beetle grubs, Gibson City, University of Illinois, 2006**

Product	Rate[1,2]	Placement[1,2]	Mean stand count (plants per acre)[3,4]		Mean no. grubs,[4,5] 24 May	Mean yield (bu/A),[4,6] 25 Sep
			10 May	24 May		
Poncho 250	0.25	Seed	28,670 a	27,670 a	9.33 a	222.10 a
Poncho 1250	1.25	Seed	28,670 a	26,670 a	4.00 a	199.05 a
Cruiser 5FS	0.25	Seed	28,670 a	29,000 a	9.00 a	233.43 a
Cruiser 5FS	1.25	Seed	25,670 a	25,670 a	10.00 a	214.79 a
Aztec 4.67G[7]	1.50	Furrow	28,333 a	27,670 a	4.33 a	219.05 a
Force 3G	4.00	Band	28,333 a	30,330 a	6.00 a	217.48 a
Fortress 5G[7]	1.50	Furrow	29,670 a	30,000 a	1.67 a	220.29 a
Regent 4SC	0.24	Furrow	28,000 a	28,330 a	5.00 a	200.17 a
Regent TS	0.33	Seed	26,000 a	28,000 a	4.00 a	228.33 a
Untreated check	—	—	28,000 a	28,000 a	3.33 a	213.69 a
Untreated check	—	—	26,670 a	27,670 a	7.00 a	201.63 a

[1] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[2] Rates of application for furrow placements are ounces (oz) of product per 1,000 ft of row.
[3] Stand counts are based upon the number of plants per 17.5 ft of row (1/1,000 acre).
[4] Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).
[5] Samples were taken from 1 m of row.
[6] Corn ears were hand harvested from 17.5 ft of row (1/1,000 acre) and converted to bushels per acre (bu/A) at 15% moisture.
[7] Applied with modified SmartBox metering units.

TABLE 7.4 • **Evaluation of products to control Japanese beetle grubs and grape colaspis larvae, Germantown, University of Illinois, 2006**

Product	Rate[1,2]	Placement[1,2]	Mean stand count (plants per acre)[3,4]		Mean no. grubs,[4,5] 14 June	Mean no. grape colaspis,[4,5] 14 June	Mean yield (bu/A)[4,6] 6 Oct
			14 June	27 June			
Poncho 250	0.25	Seed	31,330 a	32,330 a	1.00 a	12.00 a	99.39 abc
Poncho 1250	1.25	Seed	29,670 a	29,330 a	1.33 a	0.67 a	117.38 a
Cruiser 5FS	0.25	Seed	30,000 a	29,000 a	1.67 a	2.67 a	91.31 abc
Cruiser 5FS	1.25	Seed	26,670 a	27,330 a	2.00 a	1.67 a	96.97 abc
Aztec 4.67G[7]	1.50	Furrow	28,330 a	28,670 a	0.33 a	1.67 a	76.64 c
Force 3G	4.00	Band	32,330 a	32,330 a	1.00 a	3.33 a	99.00 abc
Fortress 5G[7]	1.50	Furrow	28,330 a	28,670 a	1.33 a	1.00 a	88.30 bc
Regent 4SC	0.24	Furrow	32,670 a	32,330 a	0.67 a	1.33 a	112.27 ab
Regent TS	0.33	Seed	28,000 a	27,330 a	2.00 a	2.00 a	78.41 c
Untreated check	—	—	28,000 a	27,670 a	0.33 a	11.00 a	112.73 ab
Untreated check	—	—	30,330 a	30,000 a	0.67 a	2.00 a	101.24 abc

[1] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[2] Rates of application for furrow placements are ounces (oz) of product per 1,000 ft of row.
[3] Stand counts are based upon the number of plants per 17.5 ft of row (1/1,000 acre).
[4] Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).
[5] Samples were taken from 1 m of row.
[6] Corn ears were hand harvested from 17.5 ft of row (1/1,000 acre) and converted to bushels per acre (bu/A) at 15% moisture. Low yields were attributed to a significant amount of European corn borer injury combined with the late planting date, rather than to injury caused by Japanese beetle grubs or grape colaspis larvae.
[7] Applied with modified SmartBox metering units.

SECTION 8

Evaluation of insecticidal seed treatments to control Japanese beetle grubs *(Popillia japonica)* and grape colaspis larvae (*Colaspis brunnea*) in Illinois, 2006

Ronald E. Estes, Jared B. Schroeder, Kevin L. Steffey, and Michael E. Gray

Location

We established two trials at two different locations—Agrigultural Engineering Farm near Urbana (Champaign County) and Richard Peters Farm near Germantown (Clinton County).

Experimental Design and Methods

The experimental design was a randomized complete block with three replications. The plot size for each treatment was 5 ft x 17.5 ft at the Urbana site and 5 ft x 30 ft at the Germantown site. Samples were taken to determine the number of Japanese beetle grubs per meter of row in all treatments. At the Germantown site, numbers of grape colaspis larvae in each treatment also were recorded. Stand counts were taken from 17.5 ft of row (1/1,000 acre) on two different dates and converted to numbers of plants per acre. For each treatment, 17.5 ft of row (1/1,000 acre) were hand harvested, shelled, and weighed, and the data were converted to bushels per acre at 15% moisture.

Planting and Insecticide Application

Trials were planted 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. 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 firming wheels. Cable-mounted tines were attached behind each of the row units to improve insecticide incorporation.

Agronomic Information

Agronomic information is listed in Table 8.1.

Climatic Conditions

Precipitation data are presented in Appendix II.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.0.5. (Copyright© 1982–2003 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Mean stand counts and mean numbers of grubs are presented in Tables 8.2 and 8.4. Mean numbers of grape colaspis larvae at the Germantown site are presented in Table 8.4. Mean yields are presented in Tables 8.3, and 8.5. Due to the low numbers of insects at both locations, there were no significant differences in stand counts, numbers of grubs or grape colaspis larvae, or yields among any of the treatments.

TABLE 8.1 • Agronomic information for the efficacy trials of products to control Japanese beetle grubs and grape colaspis larvae, University of Illinois, 2006

	Urbana	Germantown
Planting date	26 April	30 May
Row spacing	30 inches	30 inches
Seeding rate	33,000/acre	33,000/acre
Previous crop	Soybean	Clover

TABLE 8.3 • Evaluation of products to control Japanese beetle grubs, Urbana, University of Illinois, 2006

Product	Rate	Rate unit	Placement	Mean weight (lb) of 10 shelled ears,[1] 6 Oct
Maxim XL 2.7 FS	3.5	g a.i./100 kg	Seed	4.43 a
+ Apron XL 3 LS	1.0	g a.i./100 kg	Seed	
+ Dynasty .83 FS	1.0	g a.i./100 kg	Seed	
Cruiser Extreme	0.138	mg a.i./seed	Seed	3.57 a
+ Cruiser 5 FS	0.125	mg a.i./seed	Seed	
Cruiser 5 FS	0.25	mg a.i./seed	Seed	4.05 a
+ Maxim XL 2.7 FS	3.5	g a.i./100 kg	Seed	
+ Apron XL 3 LS	1.0	g a.i./100 kg	Seed	
+ Dynasty .83 FS	1.0	g a.i./100 kg	Seed	
Liquid Force	0.46	oz/1,000 ft row	Band	4.33 a
Poncho 250	0.25	mg a.i./seed	Seed	4.07 a
+ Maxim XL 2.7 FS	3.5	g a.i./100 kg	Seed	
+ Apron XL 3 LS	1.0	g a.i./100 kg	Seed	

[1] Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).

TABLE 8.4 • Evaluation of products to control Japanese beetle grubs and grape colaspis larvae, Germantown, University of Illinois, 2006

Product	Rate	Rate unit	Placement	Mean stand count (plants per acre)[1,2]		Mean no. grape colaspis[2,3]	Mean no. grubs[2,3]
				14 June	27 June	14 June	14 June
Maxim XL 2.7 FS	3.5	g a.i./100 kg	Seed	27,000 a	29,330 a	3.00 a	2.00 a
+ Apron XL 3 LS	1.0	g a.i./100 kg	Seed				
+ Dynasty .83 FS	1.0	g a.i./100 kg	Seed				
Cruiser Extreme	0.138	mg a.i./seed	Seed	28,670 a	28,000 a	2.33 a	1.67 a
+ Cruiser 5 FS	0.125	mg a.i./seed	Seed				
Cruiser 5 FS	0.25	mg a.i./seed	Seed	26,670 a	28,330 a	0.67 a	1.33 a
+ Maxim XL 2.7 FS	3.5	g a.i./100 kg	Seed				
+ Apron XL 3 LS	1.0	g a.i./100 kg	Seed				
+ Dynasty .83 FS	1.0	g a.i./100 kg	Seed				
Liquid Force	0.46	oz/1,000 ft row	Band	28,000 a	28,330 a	2.00 a	0.33 a
Poncho 250	0.25	mg a.i./seed	Seed	33,670 a	32,000 a	4.00 a	2.00 a
+ Maxim XL 2.7 FS	3.5	g a.i./100 kg	Seed				
+ Apron XL 3 LS	1.0	g a.i./100 kg	Seed				

[1] Stand counts are based upon the number of plants per 17.5 ft of row (1/1,000 acre).
[2] Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).
[3] Samples were taken from 1 m of row.

TABLE 8.5 • **Evaluation of products to control Japanese beetle grubs and grape colaspis larvae, Germantown, University of Illinois, 2006**

Product	Rate	Rate unit	Placement	Mean yield (bu/A)[1,2]
Maxim XL 2.7 FS	3.5	g a.i./100 kg	Seed	92.01 a
+ Apron XL 3 LS	1.0	g a.i./100 kg	Seed	
+ Dynasty .83 FS	1.0	g a.i./100 kg	Seed	
Cruiser Extreme	0.138	mg a.i./seed	Seed	64.70 a
+ Cruiser 5 FS	0.125	mg a.i./seed	Seed	
Cruiser 5 FS	0.25	mg a.i./seed	Seed	76.67 a
+ Maxim XL 2.7 FS	3.5	g a.i./100 kg	Seed	
+ Apron XL 3 LS	1.0	g a.i./100 kg	Seed	
+ Dynasty .83 FS	1.0	g a.i./100 kg	Seed	
Liquid Force	0.46	oz/1,000 ft row	Band	91.03 a
Poncho 250	0.25	mg a.i./seed	Seed	94.14 a
+ Maxim XL 2.7 FS	3.5	g a.i./100 kg	Seed	
+ Apron XL 3 LS	1.0	g a.i./100 kg	Seed	

[1] Corn ears were hand harvested from 17.5 ft of row (1/1,000 acre) and converted to bushels per acre (bu/A) at 15% moisture. Low yields were attributed to a significant amount of European corn borer injury combined with the late planting date, rather than to injury caused by Japanese beetle grubs or grape colaspis larvae.
[2] Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).

SECTION 9

Evaluation of reduced-rate, Smartbox-applied insecticides to control Japanese beetle grubs *(Popillia japonica)* in Illinois, 2006

Ronald E. Estes, Jared B. Schroeder, Kevin L. Steffey, and Michael E. Gray

Location

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

Experimental Design and Methods

The experimental design was a randomized complete block with three replications. The plot size for each treatment was 5 ft x 17.5 ft. Samples were taken to determine the number of Japanese beetle grubs per meter of row in all treatments. Stand counts were taken from 17.5 ft of row (1/1,000 acre) on two different dates and converted to numbers of plants per acre. For each treatment, 10 ears were hand harvested, shelled, and weighed. The ear weights were not converted to bushels per acre.

Planting and Insecticide Application

The corn hybrid used for the study was DKC61-72. The trial was planted on 26 April 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 SmartBox metering units mounted to each row. Plastic tubes directed the insecticide granules into the seed furrow. All insecticides were applied in front of the firming wheels. Cable-mounted tines were attached behind each of the row units to improve insecticide incorporation.

Agronomic Information

Agronomic information is listed in Table 9.1.

Climatic Conditions

Precipitation data are presented in Appendix II.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.0.5. (Copyright© 1982–2003 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Mean stand counts, numbers of grubs per meter of row, and weights (lb) of 10 corn ears are presented in Table 9.2. There were no significant differences in stand counts or ear weights among any of the treatments, very likely because of the low numbers of Japanese beetle grubs in the trial area (no significant differences among treatments).

TABLE 9.1 • Agronomic information for the efficacy trial of products to control Japanese beetle grubs, Urbana, University of Illinois, 2006

Planting date	26 April, 2006
Row spacing	30 inches
Seeding rate	33,000/acre
Previous crop	Soybean

TABLE 9.2 • **Evaluation of Smartbox-applied products to control Japanese beetle grubs, Urbana, University of Illinois, 2006**

Product	Rate[1,2]	Placement[1,2]	Mean stand count (plants per acre)[3,4] 10 May	Mean stand count (plants per acre)[3,4] 24 May	Mean no. grubs,[4,5] 17 May	Mean weight (lb) of 10 shelled ears,[4] 16 Oct
Aztec 4.67G[6]	1.00	Furrow	30,670 a	29,000 a	2.67 a	3.52 a
Aztec 4.67G[6]	1.50	Furrow	28,670 a	28,330 a	6.33 a	3.59 a
Aztec 4.67G[6]	2.00	Furrow	28,670 a	28,670 a	5.33 a	3.74 a
Fortress 5G[6]	1.00	Furrow	29,000 a	26,330 a	3.33 a	3.71 a
Fortress 5G[6]	1.50	Furrow	28,670 a	28,670 a	3.67 a	3.67 a
Fortress 5G[6]	2.00	Furrow	28,670 a	26,670 a	6.33 a	3.84 a
Poncho 250	0.25	Seed	30,000 a	30,330 a	5.33 a	3.21 a
Untreated check	—	—	30,330 a	28,330 a	6.00 a	3.63 a

[1] Rates of application for furrow placements are ounces (oz) of product per 1,000 ft of row.
[2] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[3] Stand counts are based upon number of plants per 17.5 ft of row (1/1,000 acre).
[4] Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).
[5] Samples were taken from 1 m of row.
[6] Applied with modified SmartBox metering units.

SECTION 10

Evaluation of Herculex transgenic corn hybrids to control European corn borer *(Ostrinia nubilalis)* in Illinois, 2006

Ronald E. Estes, Jared B. Schroeder, Kevin L. Steffey, and Michael E. Gray

Location

We established two trials at two different locations—Agricultural Engineering Farm near Urbana (Champaign County) and the Dave 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 15 ft (six rows) x 30 ft. The plots were evaluated for the presence of and injury by European corn borer larvae on 9 October (Urbana) and 11 October (Morrison). Within row three of each plot, 25 plants were inspected for signs of feeding by European corn borer larvae, determined by the presence or absence of either insect frass or tunneling. The numbers of plants infested were recorded, and the percentages of plants infested were determined. A subsample of five plants that had been fed upon by corn borer larvae were split with a knife, and the number of larvae found in each plant (including the ear shank) was recorded.

Planting and Insecticide Application

Trials were planted using a four-row, Almaco constructed planter with John Deere 7300 row units. Precision Planting finger pick-up style metering units were used.

Agronomic Information

Agronomic information is listed in Table 10.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix II.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.0.5. (Copyright© 1982–2003 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Tables 10.2 and 10.3 show the results from the two European corn borer trials conducted in 2006. In both trials, the natural infestation of European corn borers was severe, with 99% of the plants infested in the untreated checks.

The efficacy of both Herculex I and Herculex XTRA was excellent in both trials. There were significant differences in percentage infestation and numbers of corn borer larvae between the Herculex hybrids and the non-Bt checks in both trials. Both corn hybrids reduced percentage infestations and numbers of European corn borers by 100% or nearly 100%.

TABLE 10.1 • Agronomic information for efficacy trials of transgenic Bt corn hybrids to manage European corn borer, University of Illinois, 2006

	Morrison	Urbana
Planting date	8 May	25 May
Row spacing	30 inches	30 inches
Seeding rate	33,000/acre	33,000/acre
Previous crop	Soybean	Soybean

TABLE 10.2 • **Evaluation of Herculex transgenic corn hybrids to control European corn borer larvae, Morrison, University of Illinois, 11 October, 2006**

Product	Rate	% plants infested[1]	Avg. no. borers per ear shank[1]	Avg. no. borers per stalk[1]	Avg. no. borers per 100 plants[2]
Hx I Mycogen 2P782 + Cruiser	— 0.25 mg a.i./seed	1 b	0.00 a	0.00 b	0.00
Hx XTRA Mycogen 2P788 + Cruiser	— 0.25 mg a.i./seed	0 b	0.00 a	0.00 b	0.00
Mycogen 2784 (check) + Cruiser	— 0.25 mg a.i./seed	99 a	0.25 a	0.60 a	84.15

[1] Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).
[2] Average number of borers per 100 plants was determined by multiplying the percentage of infested plants by the average number of corn borers (% infested x [avg. no. borers in 5 ear shanks + avg. no. borers in 5 stalks]).

TABLE 10.3 • **Evaluation of Herculex transgenic corn hybrids to control European corn borer larvae, Urbana, University of Illinois, 9 October, 2006**

Product	Rate	% plants infested[1]	Avg. no. borers per ear shank[1]	Avg. no. borers per stalk[1]	Avg. no. borers per 100 plants[2]
Hx I Mycogen 2P782 + Cruiser	— 0.25 mg a.i./seed	1 b	0.00 a	0.15 b	0.15
Hx XTRA Mycogen 2P788 + Cruiser	— 0.25 mg a.i./seed	0 b	0.00 a	0.00 b	0.00
Mycogen 2784 (Check) + Cruiser	— 0.25 mg a.i./seed	99 a	0.65 a	0.81 a	144.15

[1] Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).
[2] Average number of borers per 100 plants was determined by multiplying the percentage of infested plants by the average number of corn borers (% infested x [avg. no. borers in 5 ear shanks + avg. no. borers in 5 stalks]).

SECTION 11

Evaluation of foliar and seed-applied insecticides to control soybean aphids *(Aphis glycines)* in Illinois, 2006

Ronald E. Estes, Jared B. Schroeder, 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 x 30 ft. Insecticides were applied to designated plots on 22 August. At intervals after the insecticide application, densities of soybean aphids were determined by counting the total number of aphids on three plants in each plot. Aphid densities were assessed on 30 August (8 days after treatment, DAT), 6 September (15 DAT), and 13 September (22 DAT). Two rows from each plot were mechanically harvested on 9 November, and the yields were adjusted to bushels per acre at 13% moisture.

Planting and Insecticide Application

Trials were planted on 24 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 22 August with a CO_2 backpack sprayer and a four-row hand boom. TeeJet 8002VS spray tips were calibrated to deliver a volume of 20 gal per acre. The plots with the treatment QRD 400 were sprayed a second time on 30 August, and a third time on 6 September.

Agronomic Information

Agronomic information is listed in Table 11.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix II.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.0.5. (Copyright© 1982–2003 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Densities of soybean aphids are presented in Table 11.2. Densities varied considerably among the plots and were generally relatively low (~35 aphids per plant in the untreated check plots over the three sampling dates). Mean densities on 30 August (8 DAT) ranged from 72 (QRD 400 at 5.2 oz per acre) to 0.08 (Dimethoate 4EC at 1 pt per acre) aphids per plant, based upon a sample of three plants per plot. Mean densities on 13 Sep (22 DAT) ranged from 33.83 (untreated check) to 0 (Nufos treatments) aphids per plant.

On all sampling dates, most foliar applied treatments in the trial had comparable performance to the most effective treatments (fewest aphids per plant). The densities of aphids in the following EPA-registered, single-insecticide treatments were considerably and statistically lower than the densities of aphids in the untreated check for the duration of the experiment—Dimethoate 4EC (0.5 and 1 pt per acre), Lorsban-4E (4, 8, and 16 oz per acre), Nufos 4E (1 and 2 pt per acre), and Trimax Pro + NIS (not yet labeled for use as a foliar treatment in soybeans). The following tank mixes of insecticides also provided good control of soybean aphids—Asana XL + Lannate 2.4SL, Mustang Max + Lorsban-4E, and Nufos 4E + Dimethoate EC.

The mean number of aphids in the following treatments were not significantly different from the mean number of aphids in the untreated check for the duration of the experiment—Asana

TABLE 11.1 • Agronomic information for the efficacy trial of products to control soybean aphids, Morrison, University of Illinois, 2006

Planting date	24 May
Row spacing	30 inches
Seeding rate	130,000/acre
Previous crop	Soybean
Tillage	No-till

TABLE 11.2 • Evaluation of products to control soybean aphids, Morrison, University of Illinois, 2006

Product	Rate	Rate unit	Mean no. aphids per plant[1,2]			Mean yield (bu/A)[1,2,3]
			30 Aug	6 Sep	13 Sep	
Asana XL	6.4	fl oz/a	15.92 a-d	50.75 ab	11.75 a-e	63.26 abc
Asana XL	6.4	fl oz/a	2.42 cde	1.67 c	0.67 de	61.07 abc
+ Lannate 2.4SL	4	fl oz/a				
Asana XL	6.4	fl oz/a	1.92 de	8.25 c	0.83 de	60.48 abc
+ Lorsban-4E	4	fl oz/a				
Baythroid XL	2.82	fl oz/a	11.56 b-e	3.17 c	19.92 a-d	64.23 abc
Baythroid XL	2.05	fl oz/a	7.67 b-e	1.50 c	0.42 de	59.82 abc
+ Lorsban-4E	8.0	fl oz/a				
Cruiser 5FS	100	g a.i./100 kg	17.25 abc	28.08 ab	18.17 abc	66.30 ab
Cruiser 5FS	50	g a.i./100 kg	25.75 a	39.13 a	31.92 ab	63.91 abc
Cruiser 5FS	50	g a.i./100 kg	2.17 de	3.17 c	12.75 b-e	65.06 abc
+ Warrior 1CS	3.0	fl oz/a				
Dimethoate 4EC	0.5	pt/a	0.25 e	1.25 c	1.08 cde	62.34 abc
Dimethoate 4EC	1	pt/a	0.08 e	0.08 c	0.08 de	60.76 abc
F-6113	5.12	fl oz/a	0.67 e	0.00 c	0.08 de	64.54 abc
GF-1846	13.5	fl oz/a	2.92 cde	2.92 c	1.50 de	67.26 a
Lannate 2.4SL	4	fl oz/a	4.75 b-e	7.75 bc	10.75 b-e	64.97 abc
Lannate 2.4SL	8	fl oz/a	3.92 cde	7.58 bc	6.42 b-e	64.88 abc
Lorsban 4E	8	fl oz/a	1.08 de	2.17 c	3.83 cde	58.02 c
Lorsban 4E	16	fl oz/a	1.50 de	0.00 c	0.17 de	63.80 abc
Mustang Max	3	fl oz/a	1.92 de	0.42 c	14.58 cde	62.07 abc
+ Lorsban-4E	4	fl oz/a				
Nufos 4E	2	pt/a	0.25 e	0.00 c	0.00 e	59.53 abc
Nufos 4E	1	pt/a	1.75 de	0.00 c	0.00 e	58.58 bc
Nufos 4E	0.5	pt/a	0.17 e	0.00 c	0.00 e	64.01 abc
+ Dimethoate 4EC	0.5	pt/a				
Trimax Pro	13.6	fl oz/a	0.17 e	3.17 c	0.42 de	67.63 a
+ NIS[4]	0.25	% v/v				
QRD 400	2.6	fl oz/a	20.67 ab	25.92 ab	36.0 ab	58.46 bc
QRD 400	5.2	fl oz/a	72.00 ab	73.58 a	91.25 a	62.91 abc
Warrior 1CS	2	fl oz/a	2.08 cde	12.33 bc	30.58 a-d	62.50 abc
Warrior 1CS	3	fl oz/a	5.83 a-e	9.08 bc	10.33 b-e	62.65 abc
Untreated check	—	—	31.33 a	39.08 ab	33.83 a	60.05 abc

[1] Means followed by the same letter do not differ significantly (P = 0.10, Duncan's New Multiple Range Test).
[2] Statistical analyses were conducted on transformed data; the actual means are shown.
[3] Soybeans were harvested from 25 ft of the center two rows of each plot and converted to bushels per acre (bu/A) at 13% moisture.
[4] NIS = Non-ionic surfactant.

XL (6.4 oz), Cruiser 5FS at 50 and 100 g a.i./100 kg seed, and QRD 400 (2.6 and 5.2 oz). Mean densities of aphids in the QRD 400 (5.2 oz per acre) treatment were larger than the mean densities of aphids in the untreated check for the duration of the study, although the means on each sampling date were not statistically different.

Mean yields in the trial ranged from 58.02 to 67.63 bushels per acre. All treatments had exceptional yields. The yields of all treatments were not significantly different from the yield in the untreated check. However, the mean yields from the plots treated with Trimax Pro + NIS and with GF-1846 were significantly greater than the mean yields from the plots treated with Nufos 4E at 1 pint per acre, QRD 400 at 2.6 oz per acre, and Lorsban at 8 oz per acre.

SECTION 12

Evaluation of resistant cultivars and seed-applied insecticides to control soybean aphids *(Aphis glycines)* in Illinois, 2006

Ronald E. Estes, Jared B. Schroeder, Kevin L. Steffey, Michael E. Gray, and Brian Diers

Location

We established one trial 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 split-plot, randomized complete block with four replications. The plot size for each treatment was 10 ft x 30 ft. The soybean cultivars with putative resistance to soybean aphids (LD05-16060, LD05-16529, and LD05 16611) were provided from the soybean breeding program at the University of Illinois. They also provided the aphid-susceptible isolines (SD01-76R, LD05-16519, and LD05-16621) of the resistant cultivars. Half of the seed of each cultivar (three resistant and three susceptible cultivars) was treated (by Syngenta Crop Protection personnel) with Cruiser 5FS at 50 g a.i. per 100 kg of seed. The other half of the seed of each cultivar was not treated with a seed-applied insecticide. The soybean cultivar was the whole plot, and the seed treatments (with or without) were the subplots.

A cultivar with putative resistance to soybean aphids and two susceptible cultivars were provided from the soybean breeding program at Kansas State University. Two cultivars with putative tolerance to soybean aphids were provided from the soybean breeding program at Iowa State University. Although the data from the plots with these five cultivars were included in the analyses, they are not included in this report.

Densities of soybean aphids were determined by counting the total number of aphids on three plants in each plot. Aphid densities were assessed on 15, 21, and 30 August, and on 6, 13, and 20 September.

Planting and Insecticide Application

All plots were planted on 24 May using a four-row, Almaco constructed planter with John Deere 7300 row units. Precision cone units were used to plant the seeds. Cruiser 5FS was applied to designated seed lots by Syngenta Crop Protection personnel.

Agronomic Information

Agronomic information is listed in Table 12.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix II.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.0.5. (Copyright© 1982–2003 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Densities of soybean aphids assessed on six dates are presented in Table 12.2. The densities of aphids exceeded 100 aphids per plant in the susceptible cultivars LD05-16519 (with and without Cruiser) and LD05-16621 on 15 and 21 August. However, densities of aphids declined markedly in all plots by 30 August and remained relatively low (most <50 aphids per plant) for the duration of the experiment.

There were no significant differences in numbers of aphids between SD01-76R (susceptible) and LD05-16060 (resistant isoline), both with and without Cruiser, on almost all sampling dates. However, densities of soybean aphids were significantly lower in LD05-16529 (resistant) than in LD05-16519 (susceptible isoline), both with and without Cruiser, in three of the four assessments on 15 and 21 August when densities of aphids were at their highest. Densities of soybean aphids also were significantly lower in LD05-16611 (resistant) than in LD05-16621 (susceptible isoline), both with and without

TABLE 12.1 • Agronomic information for efficacy trial of resistant cultivars and seed applied insecticides to control soybean aphids, Morrison, University of Illinois, 2006

Planting date	24 May
Row spacing	30 inches
Seeding rate	130,000/acre
Previous crop	Soybean
Tillage	No-till

Cruiser, in three of the four assessments on 15 and 21 August. These differences in densities of aphids were not apparent, for the most part, from 30 August through 20 September.

On almost all sampling dates, there were no significant differences in densities of soybean aphids between plots of a given cultivar treated with Cruiser and plots of the same cultivar not treated with Cruiser. However, accumulated aphid days (data not shown) revealed a trend for lower numbers of aphid days in all cultivars treated with Cruiser than in all cultivars not treated with Cruiser.

Some of the cultivars with putative resistance to soybean aphids show promise for future development. The impact of Cruiser on densities of aphids in both resistant and susceptible cultivars deserves further attention.

TABLE 12.2 • Evaluation of resistant cultivars and seed-applied insecticides to control soybean aphids, Morrison (Whiteside County), University of Illinois, 2006

Product	Resistant	Rate	Rate unit	Mean no. aphids per plant[1,2]					
				15 Aug	21 Aug	30 Aug	6 Sep	13 Sep	20 Sep
SD01-76R + Cruiser 5FS	No	— 50	— g a.i./100 kg	24.75 def	41.00 b–e	14.67 a	28.25 a	7.58 d	—[3]
LD05-16060 + Cruiser 5FS	Yes	— 50	— g a.i./100 kg	2.42 f	49.42 b–e	15.25 a	13.25 a	9.58 cd	3.00 ef
LD05-16519 + Cruiser 5FS	No	— 50	— g a.i./100 kg	158.75 a–d	208.75 ab	53.00 a	26.5 a	21.08 abc	0.83 f
LD05-16529 + Cruiser 5FS	Yes	— 50	— g a.i./100 kg	3.58 f	8.92 def	6.67 a	7.17 a	15.50 cd	6.00 c–f
LD05-16611 + Cruiser 5FS	Yes	— 50	— g a.i./100 kg	2.67 f	1.08 f	7.11 a	10.58 a	13.50 bcd	10.25 a–f
LD05-16621 + Cruiser 5FS	No	— 50	— g a.i./100 kg	69.83 b–f	61.58 b–e	22.75 a	6.58 a	24.33 abc	90.25 a
SD01-76R	No	—	—	49.00 a–e	59.83 a–d	51.00 a	37.25 a	38.75 abc	—[3]
LD05-16060	Yes	—	—	29.50 c–f	6.17 ef	15.92 a	20.25 a	38.75 abc	9.17 b-f
LD05-16519	No	—	—	139.33 a–d	123.00 abc	35.75 a	11.92 a	17.92 bcd	2.00 def
LD05-16529	Yes	—	—	18.58 f	49.92 b–e	13.83 a	6.42 a	19.75 bcd	23.92 b–f
LD05-16611	Yes	—	—	13.11 ef	16.56 ef	10.44 a	17.67 a	12.50 a–d	22.89 abc
LD05-16621	No	—	—	155.25 abc	204.25 a	30.11 a	32.00 a	36.08 abc	38.58 ab

[1] Means followed by the same letter do not differ significantly (P = 0.10, Duncan's New Multiple Range Test).
[2] Statistical analyses were conducted on transformed data; the actual means are shown.
[3] Not sampled; soybeans had reached maturity.

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.

Vaughn, Ty, T. Cavato, G. Grar, T. Coombe, T. DeGooyer, S. Ford, M. Groth, A. Howe, S. Johnson, K. Kolacz, C. Pilcher, J. Purcell, C. Romano, L. English, and J. Pershing. A method of controlling corn rootworm feeding using a *Bacillus thuringiensis* protein expressed in transgenic maize. Journal of Crop Science 45: 931–938.

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 = 1½ 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 • Temperature and Precipitation

Appendix II • 2006 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.04	52
April 2	T	43
April 3	0.71	51
April 4	0.05	42
April 5	0.00	44
April 6	0.00	48
April 7	0.01	49
April 8	0.00	41
April 9	0.00	38
April 10	0.00	44
April 11	0.00	56
April 12	0.12	60
April 13	0.00	63
April 14	0.04	67
April 15	T	64
April 16	0.04	61
April 17	1.29	49
April 18	0.00	51
April 19	0.05	56
April 20	0.00	55
April 21	0.00	60
April 22	0.05	58
April 23	T	54
April 24	0.00	56
April 25	0.02	55
April 26	0.09	41
April 27	0.00	50
April 28	0.00	58
April 29	0.00	59
April 30	0.98	55
Total	**3.49**	

M=Missing
T=Trace

2006 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.26	55
May 2	0.13	56
May 3	0.00	62
May 4	0.00	62
May 5	0.00	56
May 6	0.00	47
May 7	0.00	51
May 8	0.00	57
May 9	0.00	63
May 10	0.04	61
May 11	0.32	61
May 12	0.61	44
May 13	0.06	41
May 14	0.11	45
May 15	0.28	50
May 16	0.15	55
May 17	0.07	58
May 18	0.10	59
May 19	0.03	54
May 20	T	52
May 21	0.00	60
May 22	0.00	48
May 23	0.00	57
May 24	0.00	63
May 25	0.81	68
May 26	0.21	67
May 27	0.00	72
May 28	0.19	76
May 29	0.00	82
May 30	T	82
May 31	0.27	78
Total	**3.64**	

M=Missing
T=Trace

2006 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	T	69
June 2	0.00	69
June 3	0.00	69
June 4	0.00	65
June 5	0.00	65
June 6	0.00	70
June 7	0.05	71
June 8	0.00	71
June 9	0.00	73
June 10	1.63	56
June 11	0.09	53
June 12	T	56
June 13	0.00	62
June 14	0.00	67
June 15	T	70
June 16	0.00	76
June 17	0.00	80
June 18	0.01	80
June 19	0.10	71
June 20	0.00	72
June 21	0.12	72
June 22	0.19	76
June 23	0.22	69
June 24	0.00	66
June 25	0.17	71
June 26	0.45	68
June 27	0.02	65
June 28	0.06	70
June 29	0.00	66
June 30	0.00	69
Total	**3.11**	

M=Missing
T=Trace

2006 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.00	74
July 2	0.05	79
July 3	0.51	77
July 4	0.08	76
July 5	0.00	70
July 6	0.00	68
July 7	0.00	68
July 8	0.00	69
July 9	T	73
July 10	0.00	76
July 11	0.13	69
July 12	0.23	71
July 13	0.00	74
July 14	0.00	71
July 15	T	79
July 16	0.00	82
July 17	0.00	82
July 18	0.01	82
July 19	0.00	74
July 20	0.82	77
July 21	0.10	74
July 22	0.13	65
July 23	0.00	70
July 24	0.00	72
July 25	0.00	77
July 26	0.09	80
July 27	0.26	78
July 28	T	77
July 29	0.00	80
July 30	0.00	84
July 31	0.00	83
Total	**2.41**	

M=Missing
T=Trace

2006 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.00	86
August 2	0.00	85
August 3	1.09	82
August 4	0.15	74
August 5	0.00	75
August 6	0.00	73
August 7	0.07	75
August 8	0.00	75
August 9	0.00	71
August 10	0.00	74
August 11	0.06	73
August 12	0.00	69
August 13	0.00	70
August 14	T	71
August 15	0.00	69
August 16	0.00	70
August 17	0.00	72
August 18	0.00	71
August 19	0.40	73
August 20	0.00	69
August 21	0.00	68
August 22	0.00	70
August 23	0.00	74
August 24	T	75
August 25	0.00	75
August 26	0.02	75
August 27	0.00	72
August 28	T	70
August 29	0.79	64
August 30	0.00	66
August 31	0.00	66
Total	**2.58**	

M=Missing
T=Trace

2006 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	0.00	67
September 2	0.00	66
September 3	0.00	67
September 4	0.59	67
September 5	1.11	63
September 6	0.12	65
September 7	0.00	70
September 8	0.00	70
September 9	0.00	71
September 10	0.25	65
September 11	0.93	62
September 12	0.15	62
September 13	0.09	64
September 14	0.07	58
September 15	0.00	64
September 16	0.00	67
September 17	0.00	69
September 18	0.13	68
September 19	0.00	58
September 20	0.03	46
September 21	0.00	51
September 22	0.09	58
September 23	0.24	64
September 24	0.01	60
September 25	0.01	55
September 26	0.00	58
September 27	0.01	62
September 28	0.00	54
September 29	0.00	47
September 30	0.00	52
Total	**3.83**	

M=Missing
T=Trace

2006 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	0.02	57
October 2	0.09	62
October 3	1.13	70
October 4	0.00	71
October 5	0.00	58
October 6	0.00	51
October 7	0.00	52
October 8	0.00	56
October 9	0.00	59
October 10	0.00	57
October 11	0.46	52
October 12	0.04	39
October 13	0.02	33
October 14	0.00	40
October 15	0.00	39
October 16	0.01	41
October 17	0.73	51
October 18	0.01	53
October 19	M	M
October 20	M	M
October 21	M	M
October 22	M	M
October 23	M	M
October 24	M	M
October 25	M	M
October 26	M	M
October 27	M	M
October 28	M	M
October 29	M	M
October 30	M	M
October 31	M	M
Total	**2.51**	

M=Missing
T=Trace

2006 Daily Weather Data for Germantown*, Illinois (Midwest Climate Center)

*Data for Germantown was taken from Carlyle Reservoir, IL.

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.00	62
April 2	0.30	55
April 3	0.37	59
April 4	0.00	46
April 5	0.00	50
April 6	0.13	60
April 7	1.20	62
April 8	0.35	56
April 9	T	41
April 10	0.00	48
April 11	0.00	60
April 12	0.00	67
April 13	0.00	68
April 14	0.00	72
April 15	0.00	76
April 16	0.00	75
April 17	0.00	66
April 18	0.00	55
April 19	0.08	65
April 20	0.00	66
April 21	0.00	64
April 22	0.00	62
April 23	0.00	65
April 24	0.00	63
April 25	0.00	66
April 26	0.00	53
April 27	0.00	50
April 28	0.00	57
April 29	0.15	62
April 30	0.07	62
Total	**2.65**	

M=Missing
T=Trace

2006 Daily Weather Data for Germantown, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.71	60
May 2	1.05	61
May 3	0.01	64
May 4	0.44	65
May 5	0.00	60
May 6	0.00	54
May 7	0.00	55
May 8	0.00	61
May 9	0.00	61
May 10	0.03	64
May 11	1.18	60
May 12	0.00	54
May 13	0.00	52
May 14	0.01	49
May 15	0.02	50
May 16	0.39	55
May 17	0.07	57
May 18	0.05	62
May 19	T	60
May 20	0.03	64
May 21	0.04	60
May 22	0.00	66
May 23	0.00	63
May 24	0.00	67
May 25	0.48	75
May 26	0.00	76
May 27	0.00	78
May 28	0.00	80
May 29	0.00	80
May 30	0.00	81
May 31	0.00	78
Total	**4.51**	

M=Missing
T=Trace

2006 Daily Weather Data for Germantown, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	0.21	76
June 2	1.69	70
June 3	0.01	70
June 4	0.10	73
June 5	0.01	69
June 6	0.00	71
June 7	0.00	74
June 8	0.00	75
June 9	0.00	77
June 10	0.00	76
June 11	0.80	70
June 12	0.02	72
June 13	0.00	71
June 14	0.00	69
June 15	0.00	74
June 16	0.00	77
June 17	0.07	81
June 18	0.28	78
June 19	0.01	74
June 20	0.00	80
June 21	0.00	83
June 22	0.00	84
June 23	0.22	83
June 24	0.00	77
June 25	0.00	77
June 26	0.00	72
June 27	0.00	70
June 28	0.00	70
June 29	0.00	76
June 30	0.00	77
Total	**3.42**	

M=Missing
T=Trace

2006 Daily Weather Data for Germantown, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	T	74
July 2	0.00	79
July 3	0.00	80
July 4	0.00	79
July 5	0.00	81
July 6	0.00	69
July 7	0.00	75
July 8	0.00	80
July 9	0.00	77
July 10	0.00	78
July 11	0.00	78
July 12	1.30	M
July 13	0.00	M
July 14	0.60	83
July 15	0.03	80
July 16	0.00	82
July 17	0.00	81
July 18	0.00	82
July 19	1.11	80
July 20	0.00	84
July 21	0.50	83
July 22	0.24	77
July 23	0.00	71
July 24	0.00	75
July 25	0.00	76
July 26	0.00	80
July 27	0.00	82
July 28	0.00	81
July 29	0.00	81
July 30	0.13	82
July 31	0.00	84
Total	**3.91**	

M=Missing
T=Trace

2006 Daily Weather Data for Germantown, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.00	86
August 2	0.00	86
August 3	0.08	86
August 4	0.00	78
August 5	0.00	78
August 6	0.00	77
August 7	0.00	83
August 8	0.00	78
August 9	0.30	83
August 10	0.03	82
August 11	0.01	83
August 12	0.00	77
August 13	0.00	77
August 14	0.77	78
August 15	0.04	75
August 16	0.00	75
August 17	0.00	75
August 18	0.00	77
August 19	0.07	81
August 20	0.25	80
August 21	0.00	75
August 22	0.00	73
August 23	0.00	75
August 24	0.00	77
August 25	0.00	75
August 26	0.00	77
August 27	0.01	79
August 28	0.04	78
August 29	0.03	72
August 30	0.00	69
August 31	0.02	68
Total	**1.65**	

M=Missing
T=Trace

2006 Daily Weather Data for Germantown, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	0.00	M
September 2	0.00	M
September 3	0.00	67
September 4	0.00	M
September 5	0.87	M
September 6	0.26	M
September 7	0.00	69
September 8	0.00	71
September 9	0.00	M
September 10	0.00	M
September 11	0.00	M
September 12	0.06	M
September 13	0.00	67
September 14	M	M
September 15	0.00	67
September 16	0.00	M
September 17	0.00	M
September 18	0.47	61
September 19	0.00	60
September 20	0.00	54
September 21	0.00	53
September 22	0.00	60
September 23	0.60	M
September 24	0.00	M
September 25	0.13	56
September 26	0.00	M
September 27	0.00	65
September 28	0.00	M
September 29	0.00	M
September 30	0.01	M
Total	**2.40**	

M=Missing
T=Trace

2006 Daily Weather Data for Germantown, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	0.00	58
October 2	0.00	M
October 3	0.00	M
October 4	0.00	80
October 5	0.00	M
October 6	0.00	54
October 7	0.00	57
October 8	0.00	58
October 9	0.00	M
October 10	0.00	65
October 11	0.02	62
October 12	0.00	46
October 13	0.00	41
October 14	0.00	45
October 15	0.00	45
October 16	0.00	M
October 17	1.99	M
October 18	0.02	58
October 19	M	M
October 20	M	M
October 21	M	M
October 22	M	M
October 23	M	M
October 24	M	M
October 25	M	M
October 26	M	M
October 27	M	M
October 28	M	M
October 29	M	M
October 30	M	M
October 31	M	M
Total	**2.03**	

M=Missing
T=Trace

2006 Daily Weather Data for Gibson City, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.00	58
April 2	0.00	44
April 3	0.72	54
April 4	0.02	44
April 5	0.00	45
April 6	0.14	48
April 7	M	M
April 8	0.00	52
April 9	0.00	38
April 10	0.00	42
April 11	0.00	53
April 12	0.06	61
April 13	0.00	62
April 14	1.17	67
April 15	0.00	67
April 16	0.02	65
April 17	1.81	62
April 18	0.00	53
April 19	0.35	56
April 20	M	M
April 21	0.00	61
April 22	0.00	59
April 23	0.00	59
April 24	0.00	58
April 25	0.00	56
April 26	0.11	40
April 27	0.00	48
April 28	0.00	56
April 29	0.00	59
April 30	0.25	56
Total	**4.65**	

M=Missing
T=Trace

2006 Daily Weather Data for Gibson City, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.03	55
May 2	0.43	57
May 3	0.00	62
May 4	0.05	62
May 5	0.00	56
May 6	0.00	52
May 7	0.00	53
May 8	0.00	59
May 9	0.00	63
May 10	0.00	65
May 11	0.46	62
May 12	0.17	49
May 13	0.10	43
May 14	0.13	45
May 15	0.17	49
May 16	0.16	57
May 17	0.03	57
May 18	0.15	61
May 19	0.00	55
May 20	0.00	57
May 21	0.00	59
May 22	0.00	56
May 23	0.00	56
May 24	0.00	63
May 25	0.47	71
May 26	0.01	72
May 27	0.00	73
May 28	0.00	78
May 29	0.00	80
May 30	0.00	80
May 31	T	79
Total	**2.36**	

M=Missing
T=Trace

2006 Daily Weather Data for Gibson City, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	0.10	74
June 2	0.16	63
June 3	0.10	69
June 4	0.00	67
June 5	0.00	66
June 6	0.00	69
June 7	0.09	72
June 8	0.00	73
June 9	0.00	75
June 10	0.00	65
June 11	0.71	57
June 12	0.01	56
June 13	0.00	63
June 14	0.00	66
June 15	0.00	73
June 16	0.00	78
June 17	0.00	77
June 18	0.05	80
June 19	0.03	72
June 20	0.00	73
June 21	0.00	75
June 22	0.00	81
June 23	0.29	73
June 24	0.00	69
June 25	0.00	72
June 26	0.00	72
June 27	2.07	68
June 28	0.02	69
June 29	0.00	68
June 30	0.00	70
Total	**3.63**	

M=Missing
T=Trace

2006 Daily Weather Data for Gibson City, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.00	73
July 2	0.00	79
July 3	0.23	81
July 4	0.80	80
July 5	0.11	71
July 6	0.00	65
July 7	0.00	67
July 8	0.00	69
July 9	0.10	71
July 10	0.00	75
July 11	1.02	77
July 12	1.11	74
July 13	0.03	74
July 14	0.00	77
July 15	M	M
July 16	0.00	79
July 17	0.00	80
July 18	0.00	81
July 19	0.00	77
July 20	0.09	80
July 21	0.12	76
July 22	M	M
July 23	0.00	68
July 24	0.00	72
July 25	0.00	75
July 26	0.00	78
July 27	1.17	77
July 28	1.47	76
July 29	0.00	79
July 30	0.09	80
July 31	0.00	82
Total	**6.34**	

M=Missing
T=Trace

2006 Daily Weather Data for Gibson City, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.00	84
August 2	0.00	83
August 3	0.01	81
August 4	0.00	73
August 5	0.00	74
August 6	0.00	75
August 7	0.02	77
August 8	0.13	73
August 9	0.00	71
August 10	0.40	74
August 11	0.00	74
August 12	0.00	73
August 13	0.00	71
August 14	0.03	75
August 15	0.00	69
August 16	0.00	70
August 17	0.00	70
August 18	0.05	71
August 19	0.51	77
August 20	0.00	73
August 21	0.00	66
August 22	0.00	67
August 23	0.00	71
August 24	0.00	74
August 25	0.00	72
August 26	0.00	72
August 27	0.73	74
August 28	0.41	73
August 29	0.15	70
August 30	0.05	64
August 31	0.21	66
Total	**2.70**	

M=Missing
T=Trace

2006 Daily Weather Data for Gibson City, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	0.00	68
September 2	M	M
September 3	M	M
September 4	M	M
September 5	0.32	67
September 6	2.11	62
September 7	0.00	68
September 8	0.00	69
September 9	0.00	70
September 10	0.11	72
September 11	0.00	70
September 12	0.98	67
September 13	0.03	67
September 14	M	M
September 15	0.00	63
September 16	0.00	67
September 17	0.00	70
September 18	0.49	71
September 19	0.00	59
September 20	0.00	49
September 21	0.00	53
September 22	0.11	56
September 23	1.01	66
September 24	0.00	61
September 25	0.00	52
September 26	0.00	57
September 27	0.00	61
September 28	0.00	58
September 29	0.00	50
September 30	0.00	52
Total	**5.37**	

M=Missing
T=Trace

2006 Daily Weather Data for Gibson City, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	0.00	57
October 2	0.00	63
October 3	1.01	73
October 4	0.00	75
October 5	0.02	69
October 6	0.00	51
October 7	0.00	50
October 8	0.00	54
October 9	0.00	59
October 10	0.00	62
October 11	0.49	58
October 12	0.11	43
October 13	0.00	36
October 14	0.00	40
October 15	0.00	40
October 16	0.00	41
October 17	1.52	51
October 18	0.00	55
October 19	M	M
October 20	M	M
October 21	M	M
October 22	M	M
October 23	M	M
October 24	M	M
October 25	M	M
October 26	M	M
October 27	M	M
October 28	M	M
October 29	M	M
October 30	M	M
October 31	M	M
Total	**3.15**	

M=Missing
T=Trace

2006 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.00	47
April 2	0.35	49
April 3	0.78	53
April 4	0.00	45
April 5	0.00	49
April 6	0.75	58
April 7	0.20	63
April 8	0.00	42
April 9	0.00	44
April 10	0.00	56
April 11	0.00	63
April 12	0.10	67
April 13	0.00	67
April 14	0.02	75
April 15	0.00	64
April 16	0.13	66
April 17	0.05	63
April 18	0.00	58
April 19	0.10	62
April 20	0.00	58
April 21	0.00	58
April 22	0.00	60
April 23	0.00	57
April 24	0.00	60
April 25	0.33	56
April 26	0.00	46
April 27	0.00	56
April 28	0.00	56
April 29	0.18	62
April 30	0.95	61
Total	**3.94**	

M=Missing
T=Trace

2006 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.30	61
May 2	0.00	60
May 3	0.02	64
May 4	0.00	60
May 5	0.00	54
May 6	0.00	50
May 7	0.00	54
May 8	0.00	61
May 9	0.11	64
May 10	0.00	62
May 11	0.00	57
May 12	0.01	49
May 13	0.16	43
May 14	0.15	45
May 15	0.25	56
May 16	0.07	59
May 17	0.08	62
May 18	0.00	61
May 19	0.00	61
May 20	0.00	59
May 21	0.00	63
May 22	0.00	61
May 23	0.00	63
May 24	0.00	75
May 25	T	77
May 26	0.00	74
May 27	0.00	76
May 28	0.00	81
May 29	0.00	81
May 30	0.00	77
May 31	0.00	74
Total	**1.15**	

M=Missing
T=Trace

2006 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	0.10	73
June 2	0.00	72
June 3	0.00	71
June 4	0.13	71
June 5	0.00	68
June 6	0.56	71
June 7	0.00	73
June 8	0.00	74
June 9	0.00	76
June 10	0.09	63
June 11	0.03	56
June 12	T	62
June 13	0.00	66
June 14	0.00	70
June 15	0.00	74
June 16	0.00	79
June 17	0.09	79
June 18	0.00	77
June 19	0.00	77
June 20	T	73
June 21	0.00	81
June 22	0.45	77
June 23	0.00	72
June 24	0.00	72
June 25	0.12	69
June 26	0.49	69
June 27	0.11	68
June 28	0.00	74
June 29	0.00	69
June 30	0.00	73
Total	**2.17**	

M=Missing
T=Trace

2006 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.02	73
July 2	0.00	80
July 3	0.04	79
July 4	0.01	79
July 5	0.00	72
July 6	0.00	70
July 7	0.00	69
July 8	0.00	71
July 9	0.00	73
July 10	0.00	M
July 11	0.25	78
July 12	0.05	79
July 13	0.00	79
July 14	0.08	79
July 15	0.00	81
July 16	0.00	84
July 17	0.00	84
July 18	0.02	86
July 19	0.00	78
July 20	0.25	80
July 21	0.13	77
July 22	0.07	71
July 23	0.00	73
July 24	0.00	79
July 25	0.00	81
July 26	0.70	82
July 27	0.00	81
July 28	0.00	80
July 29	0.00	82
July 30	0.00	85
July 31	0.00	88
Total	**1.62**	

M=Missing
T=Trace

2006 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.00	87
August 2	0.00	87
August 3	0.80	84
August 4	0.00	76
August 5	0.00	76
August 6	0.08	79
August 7	0.18	79
August 8	0.00	76
August 9	0.70	71
August 10	0.10	76
August 11	0.00	75
August 12	0.00	70
August 13	0.00	73
August 14	0.03	73
August 15	0.00	72
August 16	0.00	71
August 17	T	73
August 18	0.14	76
August 19	0.00	72
August 20	0.00	M
August 21	0.00	71
August 22	0.00	73
August 23	0.00	72
August 24	0.00	79
August 25	0.00	78
August 26	0.04	79
August 27	0.00	75
August 28	0.75	72
August 29	T	68
August 30	0.00	68
August 31	0.00	68
Total	**2.82**	

M=Missing
T=Trace

2006 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	0.00	66
September 2	0.00	68
September 3	0.00	65
September 4	0.00	62
September 5	0.00	64
September 6	0.00	68
September 7	0.00	69
September 8	0.00	70
September 9	0.00	71
September 10	0.00	67
September 11	0.78	69
September 12	0.01	62
September 13	0.00	64
September 14	0.00	62
September 15	0.00	67
September 16	0.00	72
September 17	0.00	68
September 18	0.00	58
September 19	0.00	45
September 20	0.00	49
September 21	0.00	60
September 22	0.09	68
September 23	0.00	64
September 24	0.00	58
September 25	0.00	64
September 26	0.00	62
September 27	0.00	55
September 28	0.00	52
September 29	0.00	54
September 30	0.00	60
Total	**0.88**	

M=Missing
T=Trace

2006 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	M	61
October 2	M	73
October 3	M	M
October 4	0.03	81
October 5	M	64
October 6	M	49
October 7	M	M
October 8	M	58
October 9	M	M
October 10	M	59
October 11	0.39	52
October 12	0.02	39
October 13	M	36
October 14	M	42
October 15	M	43
October 16	0.06	46
October 17	1.06	52
October 18	M	54
October 19	M	M
October 20	M	M
October 21	M	M
October 22	M	M
October 23	M	M
October 24	M	M
October 25	M	M
October 26	M	M
October 27	M	M
October 28	M	M
October 29	M	M
October 30	M	M
October 31	M	M
Total	**1.56**	

M=Missing
T=Trace

2006 Daily Weather Data for Morrison*, Illinois (Midwest Climate Center)

*Data from Morrison was taken from Fulton, IL.

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.00	51
April 2	0.00	44
April 3	1.07	50
April 4	0.00	45
April 5	0.00	45
April 6	0.00	49
April 7	0.01	52
April 8	0.00	42
April 9	0.00	41
April 10	0.00	46
April 11	0.00	57
April 12	0.09	64
April 13	0.00	63
April 14	0.40	71
April 15	0.00	68
April 16	0.19	64
April 17	0.00	57
April 18	0.00	54
April 19	0.00	56
April 20	0.00	56
April 21	0.00	61
April 22	0.00	59
April 23	0.00	58
April 24	0.00	58
April 25	0.00	59
April 26	0.00	43
April 27	0.00	53
April 28	0.00	55
April 29	0.00	57
April 30	1.08	56
Total	**2.84**	

M=Missing
T=Trace

2006 Daily Weather Data for Morrison, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	1.05	56
May 2	0.00	57
May 3	0.00	63
May 4	0.00	63
May 5	0.00	57
May 6	0.00	48
May 7	0.00	54
May 8	0.00	58
May 9	0.00	61
May 10	0.62	59
May 11	0.06	59
May 12	0.09	48
May 13	0.02	44
May 14	0.00	44
May 15	0.00	47
May 16	0.00	53
May 17	0.00	54
May 18	0.00	57
May 19	0.00	58
May 20	0.00	57
May 21	0.00	64
May 22	0.00	55
May 23	0.00	59
May 24	0.20	64
May 25	0.12	73
May 26	0.00	70
May 27	0.00	75
May 28	0.00	78
May 29	0.00	81
May 30	0.00	80
May 31	0.00	76
Total	**2.16**	

M=Missing
T=Trace

2006 Daily Weather Data for Morrison, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	0.00	72
June 2	0.00	75
June 3	0.00	73
June 4	0.00	72
June 5	0.00	69
June 6	0.00	71
June 7	0.62	69
June 8	0.00	75
June 9	0.00	76
June 10	0.98	59
June 11	0.61	54
June 12	0.05	56
June 13	0.00	64
June 14	0.00	67
June 15	0.03	68
June 16	0.00	74
June 17	0.00	82
June 18	0.23	81
June 19	0.00	76
June 20	0.00	72
June 21	0.25	68
June 22	0.00	75
June 23	0.00	69
June 24	0.00	69
June 25	0.43	72
June 26	0.34	71
June 27	0.00	67
June 28	0.07	71
June 29	0.00	67
June 30	0.00	70
Total	**3.61**	

M=Missing
T=Trace

2006 Daily Weather Data for Morrison, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.00	78
July 2	0.00	80
July 3	1.73	78
July 4	0.51	77
July 5	0.00	72
July 6	0.00	70
July 7	0.00	69
July 8	0.00	71
July 9	0.00	71
July 10	0.00	77
July 11	0.16	70
July 12	1.10	74
July 13	0.01	75
July 14	0.01	76
July 15	0.00	80
July 16	0.00	85
July 17	0.00	83
July 18	0.00	84
July 19	0.00	74
July 20	0.41	76
July 21	0.00	76
July 22	0.66	73
July 23	0.39	71
July 24	0.00	72
July 25	0.00	76
July 26	0.60	78
July 27	0.11	80
July 28	0.27	81
July 29	0.00	81
July 30	0.00	82
July 31	0.00	85
Total	**5.96**	

M=Missing
T=Trace

2006 Daily Weather Data for Morrison, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.00	84
August 2	0.00	88
August 3	0.10	84
August 4	0.00	79
August 5	0.00	74
August 6	0.00	79
August 7	0.00	82
August 8	0.00	73
August 9	0.00	74
August 10	0.03	71
August 11	0.50	76
August 12	0.00	70
August 13	0.00	70
August 14	0.00	71
August 15	0.00	69
August 16	0.00	69
August 17	0.00	70
August 18	0.16	67
August 19	0.11	68
August 20	0.00	71
August 21	0.00	69
August 22	0.00	70
August 23	0.00	74
August 24	0.00	75
August 25	0.00	77
August 26	0.81	77
August 27	0.38	75
August 28	0.00	71
August 29	0.65	67
August 30	0.00	71
August 31	0.00	69
Total	**2.74**	

M=Missing
T=Trace

2006 Daily Weather Data for Morrison, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	M	M
September 2	M	M
September 3	M	M
September 4	M	M
September 5	M	M
September 6	M	M
September 7	M	M
September 8	M	M
September 9	M	M
September 10	M	M
September 11	M	M
September 12	M	M
September 13	M	M
September 14	M	M
September 15	M	M
September 16	M	M
September 17	M	M
September 18	M	M
September 19	M	M
September 20	M	M
September 21	M	M
September 22	M	M
September 23	M	M
September 24	M	M
September 25	M	M
September 26	M	M
September 27	M	M
September 28	M	M
September 29	M	M
September 30	M	M
Total	**M**	

M=Missing
T=Trace

2006 Daily Weather Data for Morrison, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	M	M
October 2	M	M
October 3	M	M
October 4	M	M
October 5	M	M
October 6	M	M
October 7	M	M
October 8	M	M
October 9	M	M
October 10	M	M
October 11	M	M
October 12	M	M
October 13	M	M
October 14	M	M
October 15	M	M
October 16	M	M
October 17	M	M
October 18	M	M
October 19	M	M
October 20	M	M
October 21	M	M
October 22	M	M
October 23	M	M
October 24	M	M
October 25	M	M
October 26	M	M
October 27	M	M
October 28	M	M
October 29	M	M
October 30	M	M
October 31	M	M
Total	**M**	

M=Missing
T=Trace

2006 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.00	55
April 2	0.27	52
April 3	0.13	59
April 4	0.00	45
April 5	0.00	48
April 6	0.13	54
April 7	0.02	59
April 8	0.00	55
April 9	0.00	40
April 10	0.00	50
April 11	0.00	61
April 12	0.00	69
April 13	0.00	63
April 14	0.00	73
April 15	0.01	74
April 16	0.00	70
April 17	0.01	67
April 18	0.00	57
April 19	0.14	65
April 20	0.00	57
April 21	0.00	59
April 22	0.00	60
April 23	0.00	58
April 24	0.00	62
April 25	0.04	61
April 26	0.00	42
April 27	0.00	50
April 28	0.00	56
April 29	M	60
April 30	1.04	58
Total	**1.79**	

M=Missing
T=Trace

2006 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.01	61
May 2	0.03	60
May 3	0.00	68
May 4	0.24	62
May 5	0.00	57
May 6	0.00	49
May 7	0.00	52
May 8	0.00	59
May 9	0.00	62
May 10	0.00	63
May 11	0.00	63
May 12	0.00	54
May 13	T	49
May 14	0.03	47
May 15	0.05	49
May 16	0.36	58
May 17	0.05	58
May 18	T	61
May 19	0.00	60
May 20	0.00	65
May 21	T	60
May 22	0.01	62
May 23	0.00	59
May 24	0.00	70
May 25	0.28	76
May 26	0.00	75
May 27	0.00	75
May 28	0.00	80
May 29	0.00	81
May 30	0.00	80
May 31	1.40	78
Total	**2.46**	

M=Missing
T=Trace

2006 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	1.78	75
June 2	1.14	62
June 3	0.00	72
June 4	0.00	73
June 5	0.00	66
June 6	0.00	69
June 7	T	74
June 8	0.00	73
June 9	0.00	77
June 10	0.00	72
June 11	0.53	64
June 12	0.03	62
June 13	0.00	63
June 14	0.00	71
June 15	0.00	72
June 16	0.00	76
June 17	0.00	80
June 18	T	76
June 19	0.00	73
June 20	0.00	78
June 21	0.00	82
June 22	T	80
June 23	T	77
June 24	0.00	70
June 25	0.00	74
June 26	0.00	70
June 27	0.24	70
June 28	T	71
June 29	0.00	70
June 30	0.19	74
Total	**3.91**	

M=Missing
T=Trace

2006 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.10	73
July 2	0.00	81
July 3	0.00	81
July 4	0.16	82
July 5	0.05	73
July 6	0.00	67
July 7	0.00	68
July 8	0.00	70
July 9	0.00	76
July 10	0.00	77
July 11	0.68	78
July 12	0.02	77
July 13	0.10	80
July 14	1.16	79
July 15	0.00	79
July 16	0.00	81
July 17	0.00	82
July 18	0.00	85
July 19	0.00	83
July 20	T	83
July 21	0.00	82
July 22	0.01	69
July 23	0.00	71
July 24	0.00	74
July 25	0.00	78
July 26	T	80
July 27	0.17	81
July 28	0.04	78
July 29	0.00	84
July 30	0.16	81
July 31	0.00	87
Total	**2.65**	

M=Missing
T=Trace

2006 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.00	88
August 2	0.00	88
August 3	0.28	85
August 4	T	72
August 5	0.00	74
August 6	0.00	77
August 7	0.00	84
August 8	1.77	77
August 9	0.47	71
August 10	0.00	78
August 11	0.06	76
August 12	0.00	73
August 13	0.00	73
August 14	0.07	75
August 15	0.00	67
August 16	0.00	71
August 17	0.00	73
August 18	0.00	76
August 19	0.01	78
August 20	0.00	78
August 21	0.00	70
August 22	0.00	70
August 23	0.00	72
August 24	0.00	75
August 25	0.00	77
August 26	0.29	79
August 27	0.36	77
August 28	0.18	76
August 29	0.03	73
August 30	0.01	66
August 31	0.00	67
Total	**3.53**	

M=Missing
T=Trace

2006 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	0.00	70
September 2	0.00	66
September 3	0.00	67
September 4	0.00	69
September 5	0.25	65
September 6	0.00	65
September 7	0.00	69
September 8	0.00	71
September 9	0.00	71
September 10	0.00	72
September 11	1.12	74
September 12	2.79	71
September 13	0.04	60
September 14	0.00	60
September 15	0.00	63
September 16	0.00	68
September 17	0.00	72
September 18	0.67	63
September 19	0.00	60
September 20	0.00	49
September 21	0.00	54
September 22	0.00	59
September 23	0.82	70
September 24	0.00	66
September 25	0.00	58
September 26	0.00	60
September 27	0.00	66
September 28	0.00	59
September 29	0.00	50
September 30	0.00	57
Total	**5.69**	

M=Missing
T=Trace

2006 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	0.00	62
October 2	0.00	70
October 3	0.00	79
October 4	0.00	83
October 5	0.00	69
October 6	0.00	52
October 7	0.00	51
October 8	0.00	53
October 9	0.00	58
October 10	0.00	60
October 11	0.68	54
October 12	0.01	42
October 13	0.00	40
October 14	0.00	44
October 15	0.01	43
October 16	0.00	47
October 17	0.83	52
October 18	0.00	58
October 19	M	M
October 20	M	M
October 21	M	M
October 22	M	M
October 23	M	M
October 24	M	M
October 25	M	M
October 26	M	M
October 27	M	M
October 28	M	M
October 29	M	M
October 30	M	M
October 31	M	M
Total	**1.53**	

M=Missing
T=Trace

2006 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.00	48
April 2	0.00	56
April 3	0.58	46
April 4	0.02	46
April 5	0.00	50
April 6	0.26	54
April 7	1.22	57
April 8	0.00	41
April 9	0.00	43
April 10	0.00	52
April 11	0.00	58
April 12	T	67
April 13	0.00	65
April 14	0.19	71
April 15	0.01	70
April 16	0.01	69
April 17	1.19	58
April 18	0.00	58
April 19	0.39	63
April 20	T	65
April 21	0.00	60
April 22	0.00	59
April 23	0.00	59
April 24	0.00	59
April 25	0.02	49
April 26	0.15	49
April 27	0.00	56
April 28	0.00	59
April 29	T	58
April 30	0.37	56
Total	**4.41**	

M=Missing
T=Trace

2006 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.36	58
May 2	0.32	63
May 3	0.00	62
May 4	0.03	61
May 5	0.00	56
May 6	0.00	55
May 7	0.00	59
May 8	0.00	61
May 9	0.00	62
May 10	0.00	62
May 11	0.77	55
May 12	0.08	45
May 13	0.08	46
May 14	0.05	50
May 15	0.25	55
May 16	0.43	60
May 17	0.01	62
May 18	0.21	56
May 19	0.01	58
May 20	T	59
May 21	0.00	60
May 22	T	58
May 23	0.00	61
May 24	0.00	69
May 25	0.11	74
May 26	0.01	74
May 27	0.00	76
May 28	0.00	81
May 29	0.00	80
May 30	0.00	80
May 31	0.34	76
Total	**3.06**	

M=Missing
T=Trace

2006 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	0.39	66
June 2	0.13	71
June 3	0.07	69
June 4	0.00	68
June 5	0.00	69
June 6	0.00	69
June 7	T	75
June 8	0.00	76
June 9	0.00	70
June 10	0.00	60
June 11	0.26	61
June 12	0.01	64
June 13	0.00	67
June 14	0.00	70
June 15	0.00	76
June 16	0.00	79
June 17	0.00	78
June 18	0.01	73
June 19	0.28	76
June 20	0.00	74
June 21	0.00	84
June 22	0.00	79
June 23	0.02	76
June 24	0.00	73
June 25	0.00	73
June 26	0.44	71
June 27	0.03	69
June 28	0.01	70
June 29	T	70
June 30	0.00	73
Total	**1.65**	

M=Missing
T=Trace

2006 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.01	76
July 2	0.00	82
July 3	T	83
July 4	0.71	76
July 5	0.06	69
July 6	0.00	69
July 7	0.00	70
July 8	0.00	71
July 9	0.05	76
July 10	0.01	76
July 11	0.69	77
July 12	0.30	77
July 13	1.81	77
July 14	0.02	79
July 15	0.01	81
July 16	0.00	80
July 17	0.00	79
July 18	0.00	81
July 19	0.00	81
July 20	0.64	78
July 21	0.14	72
July 22	0.44	70
July 23	0.00	72
July 24	0.00	74
July 25	0.00	77
July 26	0.00	77
July 27	1.71	80
July 28	1.25	81
July 29	0.00	81
July 30	T	82
July 31	0.00	83
Total	**7.85**	

M=Missing
T=Trace

2006 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.00	84
August 2	0.00	85
August 3	0.00	78
August 4	T	76
August 5	0.00	75
August 6	0.00	77
August 7	0.02	77
August 8	0.04	74
August 9	0.60	75
August 10	0.15	77
August 11	0.07	73
August 12	T	72
August 13	0.00	71
August 14	0.15	73
August 15	0.04	72
August 16	0.00	73
August 17	0.00	72
August 18	0.28	76
August 19	0.77	78
August 20	T	71
August 21	0.00	69
August 22	0.00	71
August 23	0.00	75
August 24	0.00	75
August 25	0.00	73
August 26	0.00	74
August 27	0.10	77
August 28	0.76	74
August 29	0.01	67
August 30	0.01	69
August 31	T	69
Total	**3.00**	

M=Missing
T=Trace

2006 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	0.01	68
September 2	0.00	68
September 3	0.00	67
September 4	0.00	67
September 5	0.05	65
September 6	0.18	69
September 7	0.00	69
September 8	0.00	71
September 9	0.00	72
September 10	0.00	72
September 11	0.00	69
September 12	0.33	69
September 13	0.02	62
September 14	T	65
September 15	0.00	68
September 16	0.00	70
September 17	0.00	73
September 18	0.62	61
September 19	0.00	51
September 20	0.00	53
September 21	T	57
September 22	0.11	66
September 23	0.00	65
September 24	T	55
September 25	0.00	58
September 26	0.00	61
September 27	0.00	64
September 28	T	53
September 29	0.00	53
September 30	0.00	60
Total	**1.32**	

M=Missing
T=Trace

2006 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	0.00	66
October 2	0.00	71
October 3	0.39	76
October 4	0.00	73
October 5	0.04	56
October 6	0.00	M
October 7	0.00	57
October 8	0.00	60
October 9	0.00	64
October 10	0.00	61
October 11	0.23	46
October 12	0.07	37
October 13	T	41
October 14	0.00	42
October 15	0.00	42
October 16	T	52
October 17	2.15	56
October 18	0.00	56
October 19	M	M
October 20	M	M
October 21	M	M
October 22	M	M
October 23	M	M
October 24	M	M
October 25	M	M
October 26	M	M
October 27	M	M
October 28	M	M
October 29	M	M
October 30	M	M
October 31	M	M
Total	**2.88**	

M=Missing
T=Trace