

CORN

SECTION 1

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

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Location

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

Experimental Design and Methods

The experimental design was a randomized complete block with four replications. Plot size for each treatment was 10 ft (four rows) x 40 ft. Five randomly selected root systems were extracted from the first row of each plot on 16 July at Monmouth and Perry, and on 22 and 29 July at Urbana and

DeKalb, respectively. Root systems were washed and rated for corn rootworm larval injury using the 0 to 3 node-injury scale developed by Oleson et al. (2005) (Appendix I). Percentage consistency at two different levels (percentage of roots with a node-injury rating less than 1.0, and with a node injury rating less than 0.25) was determined for each product at each location. Five randomly selected root systems were extracted from a subset of treatments again on 11 August at DeKalb and on 12 August at Monmouth, Perry, and Urbana to assess late-season rootworm injury. Root systems were washed and rated (0 to 3 node-injury scale) for corn rootworm larval injury.

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

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

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

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



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Planting and Insecticide Application

Trials were planted on 23, 24, and 30 April, and on 5 May at Monmouth, Urbana, Perry, and DeKalb, respectively. All trials were planted using a four-row, Almaco constructed planter with John Deere 7300 row units with Precision Planting finger pick-up style metering units. Granular insecticides were applied through modified Noble metering units or through modified SmartBox metering units mounted to each row. Plastic tubes directed the insecticide granules to either a 5-inch, slope-compensating bander or into the seed furrow. Liquid insecticides were applied at a spray volume of 5 gal per acre using a CO₂ system. All insecticides were applied in front of the firming wheels on the planter. Cable-mounted tines were attached behind each of the row units to improve insecticide incorporation.

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

Agronomic Information

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

Climatic Conditions

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

Statistical Analysis

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

Results and Discussion

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

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

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

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

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

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

¹ All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.

² Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.

³ Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.

⁴ Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).

⁵ Mean node-injury ratings were derived from five root systems per treatment in each of four replications.

⁶ Data were transformed (square root transformation) for analysis; actual means are shown.

⁷ Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).

⁸ Percentage of roots with a node-injury rating <1.0.

⁹ Percentage of roots with a node-injury rating <0.25.

¹⁰ Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

¹¹ Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

¹² Applied with modified SmartBox metering units.



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

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

Monmouth—Mean node-injury ratings and consistency percentages for rootworm injury evaluations on 16 July are presented in Table 1.4. Mean node-injury ratings in the untreated checks (UTCs) were 0.90 (DKC61-72), 1.28

(DKC63-46), 1.81 (Mycogen 2T777), 1.66 (Pioneer 32T84), and 1.76 (Pioneer 34P89), indicating that rootworm larval feeding was relatively moderate. The mean node-injury ratings for Cobalt, EXP 5B, Force 2.25CS (0.46 oz), Fortress 5G, Lorsban 15G, and Poncho 1250 were not significantly different from the mean node-injury ratings of one or more of the UTCs. The mean node-injury ratings for all other treatments were significantly lower than the mean node-injury ratings of the UTCs.

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

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

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

¹ All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.

² Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.

³ Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.

⁴ Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).

⁵ Mean node-injury ratings were derived from five root systems per treatment in each of four replications.

⁶ Data were transformed (square root transformation) for analysis; actual means are shown.

⁷ Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).

⁸ Percentage of roots with a node-injury rating <1.0.

⁹ Percentage of roots with a node-injury rating <0.25.

¹⁰ Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

¹¹ Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.



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

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

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

¹ All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.

² Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.

³ Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.

⁴ Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).

⁵ Mean node-injury ratings were derived from five root systems per treatment in each of four replications.

⁶ Data were transformed (square root transformation) for analysis; actual means are shown.

⁷ Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).

⁸ Percentage of roots with a node-injury rating <1.0.

⁹ Percentage of roots with a node-injury rating <0.25.

¹⁰ Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

¹¹ Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

¹² Applied with modified SmartBox metering units.

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

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

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

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

different from mean node-injury ratings for rootworm Bt hybrids not treated with soil insecticides.

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

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

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

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

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

¹ All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.

² Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.

³ Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.

⁴ Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).

⁵ Mean node-injury ratings were derived from five root systems per treatment in each of four replications.

⁶ Data were transformed (square root transformation) for analysis; actual means are shown.

⁷ Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).

⁸ Percentage of roots with a node-injury rating <1.0.

⁹ Percentage of roots with a node-injury rating <0.25.

¹⁰ Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

¹¹ Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

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

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

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

¹ All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.

² Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.

³ Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.

⁴ Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).

⁵ Mean node-injury ratings were derived from five root systems per treatment in each of four replications.

⁶ Data were transformed (square root transformation) for analysis; actual means are shown.

⁷ Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).

⁸ Percentage of roots with a node-injury rating <1.0.

⁹ Percentage of roots with a node-injury rating <0.25.

¹⁰ Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

¹¹ Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.



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

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

¹ All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.

² Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.

³ Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.

⁴ Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).

⁵ Mean node-injury ratings were derived from five root systems per treatment in each of four replications.

⁶ Data were transformed (square root transformation) for analysis; actual means are shown.

⁷ Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).

⁸ Percentage of roots with a node-injury rating <1.0.

⁹ Percentage of roots with a node-injury rating <0.25.

¹⁰ Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

¹¹ Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

untreated checks (UTCs) were 1.90 (DKC61-72), 1.60 (DKC63-46), 1.72 (Mycogen 2T777), 1.87 (Pioneer 32T84), and 2.23 (Pioneer 34P89), indicating corn rootworm larval densities were moderate to high. Mean node-injury ratings for all plots treated with an insecticide were significantly lower than the mean node-injury ratings of the UTCs, except plots treated with Cobalt, EXP 5B, or Poncho 1250. Cobalt, EXP 5B, or Poncho 1250 were the only treatments with mean node-injury ratings greater than 1.0. HxXTRA (Pioneer 34P94) treated with soil insecticides (Aztec 4.67G or Force 2.25CS) had significantly lower node-injury ratings than the same rootworm Bt hybrid without a soil insecticide. The mean

node-injury rating for YieldGard VT (DKC63-42) without a soil insecticide was not significantly different from the same rootworm Bt hybrid treated with soil insecticides.

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



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Late-season rootworm injury in eight treatments was assessed on 12 August (Table 1.9). Overall, mean node-injury ratings on 12 August were not noticeably different from mean node-injury ratings assessed on 16 July. However, the mean node-injury rating for HxXTRA (Pioneer 34P94) was significantly greater than the mean node-injury ratings for any of the other rootworm Bt hybrids or for Force 2.25CS. Mean node-injury ratings for all treatments, except Poncho 1250, were

significantly lower than mean node-injury ratings in the UTCs. Force 2.25CS, YieldGard VT (DKC63-42), and Force 2.25CS + YGVT (DKC63-42) were the only treatments that provided 75% or more consistency at the 1.0 level. Only Force 2.25CS and the combination of Force 2.25CS + YieldGard VT (DKC63-42) provided 75% or more consistency at the 0.25 level.

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

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

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TABLE 1.8 + continued

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

¹ All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.

² Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.

³ Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.

⁴ Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).

⁵ Mean node-injury ratings were derived from five root systems per treatment in each of four replications.

⁶ Data were transformed (square root transformation) for analysis; actual means are shown.

⁷ Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).

⁸ Percentage of roots with a node-injury rating <1.0.

⁹ Percentage of roots with a node-injury rating <0.25.

¹⁰ Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

¹¹ Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

¹² Applied with modified SmartBox metering units.

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

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

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TABLE 1.9 + continued

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

¹ All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.

² Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.

³ Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.

⁴ Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).

⁵ Mean node-injury ratings were derived from five root systems per treatment in each of four replications.

⁶ Data were transformed (square root transformation) for analysis; actual means are shown.

⁷ Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).

⁸ Percentage of roots with a node-injury rating <1.0.

⁹ Percentage of roots with a node-injury rating <0.25.

¹⁰ Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

¹¹ Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.