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Products Evaluated for Corn Rootworm Management

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Abstract
Commercially available corn rootworm products are evaluated yearly for their ability to protect corn-root systems from corn rootworm feeding injury. This report presents results from two 2005 tests, plus a three-year summary from locations throughout Iowa.

Disciplines
Agricultural Science | Agriculture | Entomology

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Introduction

Commercially available corn rootworm products are evaluated yearly for their ability to protect corn-root systems from corn rootworm feeding injury. This report presents results from two 2005 tests, plus a three-year summary from locations throughout Iowa.

Materials and Methods

2005 Crawfordsville Yield Test. Plots were planted on May 4 in an area that had been a corn rootworm beetle "catch crop," with large populations of late-planted corn the previous year. The experimental design was a randomized complete block with two-row treatments, 100 ft in length, replicated four times. A four-row John Deere 7100 planter with 30-in. row spacing was used to plant the plots at 29,900 seeds/acre. Specially designed seed hoppers with standard "finger pick-up mechanisms" were used to handle the small amounts of prebagged seed. DKC60-18, transgenic seed containing a Bt gene, was the corn hybrid used for the YieldGard Plus treatments. The seed treatments at high rates for corn rootworm were commercially applied to DKC60-19, the non-Bt equivalent of the transgenic seed. The non-Bt seed was also used with the granular and liquid insecticide treatments. Liquid Regent 4SC microtube treatments were applied at 4 gpa of finished spray. Capture 2EC liquid treatments were applied at 5 gpa. On July 13, following the majority of corn rootworm feeding, corn-root systems were dug, washed, and rated for injury on the Iowa State node-injury scale: 0.00 equals no feeding; 1.00 equals one node (circle of roots), or the equivalent of an entire node, eaten back to within approximately 1.5 in. of the stalk (or soil line if roots originate from above-ground nodes); 2.00 equals two nodes eaten; and 3.00 equals three nodes eaten. Damage in between complete nodes eaten is noted as the percentage of the node missing (e.g., 1.25=1 1/4 nodes eaten). A product consistency (%) was also calculated for each treatment. Product consistency equals the percentage of times a treatment limited feeding injury to a set benchmark. Plant stand and lodging counts were taken from 17.5 row-ft in each row. Yields were machine harvested on October 7.

2005 Pioneer and Dow Herculex RW Tests. The experimental design was a randomized complete block with four-row treatments, 20 ft in length, replicated four times. On May 4, both tests were planted adjacent to the previously described yield test. Stand counts were taken from 12 row-ft on May 24, and roots were dug for injury evaluations on July 13.

2003–2005 Summary. Treatments were applied to two 100-ft rows, replicated four times. Plots were machine harvested. In 2003 and 2004, the YieldGard RW hybrid was DKC60-12 and the non-Bt seed was DKC60-15. In 2005, the YieldGard Plus hybrid was DKC60-18 and the non-Bt was DKC60-19.

Results and Discussion

2005 Crawfordsville Yield Test (Table 1a). Drought conditions existed at Crawfordsville this year, with below-normal rainfall amounts recorded from April through August. This test showed severe root injury with 2.40 nodes injured in the check. All treatments were significantly different from the check in node-injury scores. However, Poncho and Cruiser (seed treatments) and Regent (liquid treatment) had root injuries greater than one node of roots. These three treatments plus the check were the only treatments that had lodging. YieldGard

Plus provided very consistent protection from root pruning (injury scores≤0.02) and was significantly different from all other treatments. This protection allowed roots to reach moisture and nutrients and resulted in yields that were significantly higher than all other treatments (70+ to109 bu/acre).

2005 Pioneer and Dow Herculex RW Tests (Tables 1b and 1c). The transgenic roots in each test had no pruning and only very minor scarring/channeling. Since these transgenics had not yet received EPA registration, plants were severely detasseled (or cut off below ear level) prior to tasseling and so no yield data is available.

2003–2005 Summary (Table 1d). Node-injury scores were based on the mean of 218 root systems/treatment. YieldGard RW provided excellent protection from corn rootworm feeding. YieldGard averaged 21–33 bushels more grain than any of the insecticide or seed treatments and 53 bushels more than the check.

Table 1a. 2005 evaluation of labeled corn rootworm products applied at planting time, Crawfordsville, IA.

Treatment	Placement[a]	Node injury[b,c]	Consistency[c,d] injury≤ 0.02	Percent lodging[e]	Stand count[e]	Yield (bu/acre)[c]
YieldGard Plus	Bt seed	0.05 a	71 a	0 a	29.63	171 a
Fortress 5G[f]	Furrow SB	0.11 a	21 b	0 a	30.00	94 b
Fortress 5G[g]	Furrow SB	0.15 a	8 b	0 a	30.75	101 b
Fortress 2.5G	Furrow	0.16 a	13 b	0 a	29.75	84 b
Aztec 2.1G	Furrow	0.19 a	4 b	0 a	30.50	98 b
DEFCON 2.1G	Furrow	0.23 a	13 b	0 a	30.00	78 b
Force 3G	T-band	0.24 a	0 b	0 a	29.63	101 b
Aztec 2.1G	T-band	0.27 a	0 b	0 a	29.13	74 b
DEFCON 2.1G	T-band	0.30 a	0 b	0 a	29.63	73 b
Aztec 4.67G	Furrow SB	0.35 a	0 b	0 a	30.63	96 b
Capture 2EC	T-band	0.36 a	4 b	0 a	30.13	85 b
Force 3G	Furrow	0.42 a	4 b	0 a	30.38	85 b
Lorsban 15G	T-band	0.43 a	0 b	0 a	29.88	65 b
Poncho 1250	ST	1.16 b	0 b	9 a	28.88	81 b
Regent 4SC	Furrow-M	1.39 bc	0 b	15 a	30.38	64 b
Cruiser	ST	1.63 c	0 b	20 a	30.50	66 b
Check	---	2.40 d	0 b	50 b	29.25	62 b

Table 1b. 2005 evaluation of a Pioneer hybrid with the Herculex RW gene, Crawfordsville, IA.

Treatment	Placement	Node injury[b,c]	Consistency[c,d] injury≤ 0.02	Percent lodging[e]	Stand count[e]
Herculex RW + Poncho 250	Bt seed	0.02 a	100 a	0 a	15.63
Non-Bt seed + Force 3G	T-band	0.32 a	0 b	1 a	17.00
Non-Bt seed check	---	1.73 b	0 b	53 b	18.13

Table 1c. 2005 evaluation of a Dow hybrid with the Herculex RW gene, Crawfordsville, IA.

Treatment	Placement	Node injury[b,c]	Consistency[c,d] injury≤ 0.02	Percent lodging[e]	Stand count[e]
Herculex RW + Cruiser 0.25	Bt seed	0.02 a	100 a	0 a	17.13
Non-Bt seed + Lorsban 15G	T-band	0.46 a	3 b	0 a	17.88
Non-Bt seed check	---	1.90 b	3 b	48 b	17.38

Table 1d. 2003–2005 summary of products used for corn rootworm management (7 locations).

Treatment	Placement[a]	Node injury[b,c]	Consistency[c,d] injury ≤ 0.25	Percent lodging[c]	Stand count[e]	Yield (bu/acre)[c]
YieldGard RW	Bt seed	0.03 a	99 a	1 a	27.44	183 a
Aztec 2.1G	Furrow	0.24 ab	82 b	0 a	28.14	159 b
Aztec 4.67G	Furrow SB	0.28 bc	78 b	1 a	28.28	157 b
Force 3G	T-band	0.29 bc	76 bc	0 a	27.54	162 b
Aztec 2.1G	T-band	0.30 bc	75 bc	0 a	27.90	151 bc
Force 3G	Furrow	0.35 bcd	72 bc	0 a	28.02	159 b
Fortress 2.5G	Furrow	0.49 cd	68 bc	10 a	27.84	153 bc
Fortress 5G	Furrow SB	0.57 de	61 c	4 a	27.62	155 b
Lorsban 15G	T-band	0.80 ef	44 d	6 a	28.10	150 bc
Capture 2EC	T-band	0.80 ef	42 d	7 a	27.96	151 bc
Poncho ST	ST	0.98 f	21 e	6 a	27.24	158 b
Cruiser ST	ST	1.53 g	8 ef	31 b	27.71	152 bc
Check	----	2.00 h	2 f	40 c	27.38	130 c

[a]SB=SmartBox application; ST=seed treatment; M=microtube application.

[b]Iowa State node-injury scale (0–3). Number of full or partial nodes completely eaten.

[c]Means sharing a common letter do not differ significantly according to Ryan's Q Test (P≤0.05).

[d]Product consistency=percentage of times nodal injury was less than or equal to the injury score listed.

[e]No significant differences between means (ANOVA, P≤0.05).

[f]4.5 oz material/1,000 row-ft.

[g]3.7 oz material/1,000 row-ft.