Evaluation of Ampex Insecticide for Management of Corn Rootworm Larvae

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Aaron Gassmann, associate professor
Patrick Weber, agricultural specialist
Department of Entomology

Introduction

The purpose of this study was to evaluate the effectiveness of Ampex 1.73SC soil-applied insecticide for management of corn rootworm larvae. This study used non-rootworm Bt seed (DeKalb 54-40 RIB VT2P).

Materials and Methods

Field site. The corn was planted in an area that had been planted the previous year with a trap crop, which is a mixed-maturity blend with a greater proportion of late-maturing varieties. This trap crop constitutes a favorable environment for adult female rootworm late in the season when other fields are maturing, and results in a high abundance of rootworm larvae the following year.

Field plot design. This experiment compared Ampex with an untreated check. The experimental design had four replications of each treatment, and these were planted in an alternating pattern. Each replication was eight rows wide and 275 ft long. Plots were cut to 270 ft in length to facilitate root digging and achieve uniform length at harvest.

Planting. All corn was planted with bulk seed hoppers using a four-row John Deere Max Emerge™ 7100 Integral Rigid Frame Planter that had 30-in. row spacing. We planted this study at a depth of 2 in. with a spacing of 0.6 in. between seeds (35,600 seeds/acre).

Liquid soil-applied insecticide. The Ampex 1.73SC insecticide was applied in-furrow at planting with a compressed-air system built directly into the planter by Almaco Manufacturing (Nevada, IA). Ampex was applied as ounces/1,000 row ft using Teejet XR80015EVS spray nozzles at 21 psi, to deliver 5 GPA of finished spray at a tractor speed of 4 mph. We used fertilizer (Nucleus HP 8-24-4) as the carrier for the insecticide. Both the Ampex treatment and the untreated check received starter fertilizer. The corn seed used for this study was non-rootworm Bt seed (DeKalb 54-40 RIB VT2P).

Stand counts. The number of plants in 17.5 row-ft was recorded. This was done early and late in the growing season and then averaged to provide one value for stand counts for each treatment in each replication (Table 2).

Root injury. After the majority of corn rootworm larvae had finished feeding, roots were dug July 27, 2016 to assess feeding injury. Prior to leaving the field, all roots were labeled with the study name and plot number using a permanent marker. Roots were cleaned at the ISU Johnson Farm's root washing station. Roots were first soaked in water for 2 hours and then washed with a hose to remove any remaining soil. Roots were evaluated July 28, 2016 for rootworm feeding injury, following the Iowa State Node Injury Scale (0-3) (Table 1).

Node-injury scale (0-3).

0.0 No feeding injury (lowest rating that can be given).
1.0 One node (circle of roots), or the equivalent of an entire node, pruned to within 1.5 in. of the stalk or soil line.
2.00 Two nodes pruned.
3.00 Three or more nodes pruned (highest rating that can be given).

Injury between complete nodes pruned was scored as the percentage of the node missing (e.g., 1.50 = one and a half nodes pruned and 0.25 = one quarter of one node pruned).

Lodging counts. A plant was considered lodged if it was leaning at least 30 degrees from vertical. Strong winds on June 22, 2016 likely contributed to much of the lodging observed in this study. Data on lodging were taken at harvest along with final stand counts (Table 3).

Harvest. This study was machine harvested November 7, 2016 with a modified John Deere 9410 plot combine owned by Iowa State University. The center four rows of the eight row plot were harvested. Weight (lb) and percent moisture were recorded from a HarvestMaster brand plot harvest data collection system. These measurements were converted to bushels/acre of No. 2 shelled corn (56 lb/bushel at 15.5% moisture) in Microsoft Excel (Table 4).

All data were analyzed with analysis of variance (ANOVA) in SAS 9.4. Percent product consistency (Table 1) was calculated as the percentage of times a treatment limited feeding injury to 0.25 nodes or less (greater injury can result in economic yield loss, especially when plants are moisture stressed).

Results and Discussion

Feeding injury in this study was moderate, with the untreated check suffering 1.29 nodes of injury (Table 1). We found that root injury was significantly lower for the Ampex treatment compared with the untreated check, and the Ampex treatment showed greater product consistency than the untreated check (Table 1). No difference between the treatment and check were detected for lodging or stand counts (Table 2 and Table 3). However, we found yield was significantly greater for Ampex-treated corn compared with the check (Table 4).

Acknowledgements

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Additional Information

Annual reports for the Iowa Evaluation of Insecticides and Plant-Incorporated Protectants are available online through the Department of Entomology at Iowa State University: http://www.ent.iastate.edu/dept/faculty/gassmann/rootworm

Table 1. Average root injury and product consistency for the Valent Ampex 1.73SC Strip Efficacy and Yield Study: Southeast Research and Demonstration Farm, Crawfordsville, IA.[1]

Treatment[2]	Form.	Rate[3]	Placement[4]	Node-injury[5,6,7]	Product consistency[8,9]
DeKalb non-RW Bt + Ampex	1.73SC	0.31	Furrow	0.26a	75a
DeKalb non-RW Bt	------	------	------	1.29 b	15 b

[1]Planted April 22, 2016; evaluated July 28, 2016.
[2]Non-RW Bt = an absence of any Bt trait targeting corn rootworm; DeKalb non-RW Bt = DeKalb brand VT2Pro RIB (DKC 54-40). Both treatments included Starter Fertilizer as a carrier.
[3]Insecticide listed as ounces a.i. per 1,000 row-feet.
[4]Furrow = insecticide applied at planting time.
[5]Chemical and check means based on 40 observations (10 roots/4 rows x 4 replications).
[6]Iowa State Node-Injury Scale (0-3). Number of full or partial nodes completely eaten.
[7]Chemical and check means sharing a common letter do not differ significantly according to Ryan's Q Test ($P \leq 0.05$).
[8]Product consistency = percentage of times nodal injury was 0.25 (¼ node eaten) or less.
[9]Means sharing a common letter do not differ significantly according to Ryan's Q Test ($P \leq 0.05$).

Table 2. Stand counts for the Valent Ampex 1.73SC Strip Efficacy and Yield Study: Southeast Research and Demonstration Farm, Crawfordsville, IA.[1]

Treatment[2]	Form.	Rate[3]	Placement[4]	Stand counts[5,6]
DeKalb non-RW Bt + Ampex	1.73SC	0.31	Furrow	29.00
DeKalb non-RW Bt	------	------	------	28.75

[1]Planted April 22, 2016; evaluated May 25 and November 7, 2016.
[2]Non-RW Bt = an absence of any Bt trait targeting corn rootworm; DeKalb non-RW Bt = DeKalb brand VT2Pro RIB (DKC 54-40). Both treatments included Starter Fertilizer as a carrier.
[3]Insecticide listed as ounces a.i. per 1,000 row-feet.
[4]Furrow = insecticide applied at planting time.
[5]Chemical and check means based on 16 observations (2 rows/treatment x 17.5 row-ft/treatment x 4 replications x 2 evaluations).
[6]No significant differences between means (ANOVA, $P \leq 0.05$).

Table 3. Average lodging for the Valent Ampex 1.73SC Strip Efficacy and Yield Study: Southeast Research and Demonstration Farm, Crawfordsville, IA.[1]

Treatment[2]	Form.	Rate[3]	Placement[4]	Lodging[5,6]
DeKalb non-RW Bt + Ampex	1.73SC	0.31	Furrow	33
DeKalb non-RW Bt	------	------	------	47

[1]Planted April 22, 2016; evaluated November 7, 2016.
[2]Non-RW Bt = an absence of any Bt trait targeting corn rootworm; DeKalb non-RW Bt = DeKalb brand VT2Pro RIB (DKC 54-40). Both treatments included Starter Fertilizer as a carrier.
[3]Insecticide listed as ounces a.i. per 1,000 row-feet.
[4]Furrow = insecticide applied at planting time.
[5]Chemical and check means based on 32 observations (8 rows/treatment x 17.5 row-ft/treatment x 4 replications).
[6]No significant differences between means (ANOVA, $P < 0.05$).

Table 4. Average yields for the Valent Ampex 1.73SC Strip Efficacy and Yield Study: Southeast Research and Demonstration Farm, Crawfordsville, IA.[1]

Treatment[2]	Form.	Rate[3]	Placement[4]	Bushels/ acre[5,6,7]
DeKalb non-RW Bt + Ampex	1.73SC	0.31	Furrow	190a
DeKalb non-RW Bt	------	------	------	175 b

[1]Planted April 22, 2016; machine harvested November 7, 2016
[2]Non-RW Bt = an absence of any Bt trait targeting corn rootworm; DeKalb non-RW Bt = DeKalb brand VT2Pro RIB (DKC 54-40). Both treatments included Starter Fertilizer as a carrier.
[3]Insecticide listed as ounces a.i. per 1,000 row-feet.
[4]Furrow = insecticide applied at planting time.
[5]Chemical and check means based on 4 observations (4-rows/treatment x 270 row-feet/treatment x 4 replications).
[6]Means sharing a common letter do not differ significantly according to Ryan's Q Test ($P \leq 0.05$).
[7]Yields converted to 15.5% moisture.