Reduced Corn Rootworm Adult Emergence With RNAi

CROP BULLETIN

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KEY FINDINGS:

- Trials were conducted in fields with high corn rootworm pressure to evaluate the impact of corn rootworm traits on emergence of rootworm adults from the soil.
- The corn rootworm traits in Qrome® corn and Vorceed™ Enlist® corn reduced emergence of western corn rootworm beetles by 71% and 92%, respectively.
- The addition of RNAi technology in the Vorceed Enlist trait package provided a significant advantage in managing adult emergence.

A NEW CORN ROOTWORM MANAGEMENT TOOL

- Ribonucleic acid interference (RNAi) technology has been commercialized to provide an additional unique mode of action for protection against corn rootworm and is available in Corteva Agriscience seed brands in Vorceed™ Enlist® corn.

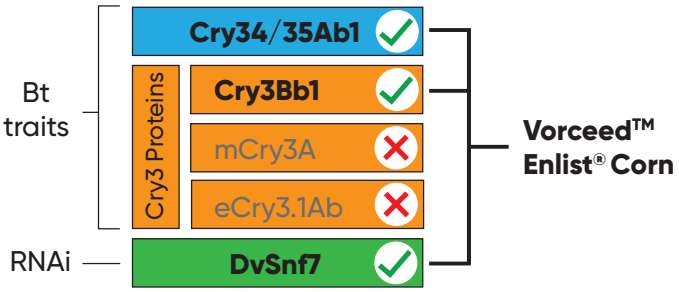

Figure 1. Vorceed Enlist corn contains three modes of action for protection against corn rootworm.

STUDY DESCRIPTION

- Field experiments were conducted in 2022 to evaluate efficacy of the corn rootworm traits in Qrome corn and Vorceed Enlist corn for reducing adult emergence.
- Experiments were conducted at six locations with natural infestations of western and northern corn rootworm.
- Study locations were specifically targeted to fields with a history of high corn rootworm pressure that were located in regions with previously reported performance issues with Bt rootworm traits.
- Adult emergence was quantified using single-plant emergence cages (Figure 2).

Table 1. Corn rootworm treatments compared in 2022 adult emergence experiments.

Treatment Description	CRW Traits	Insecticide Seed Treatment Rate (clothianidin)
Unprotected Check	none	250 IST
CRW Traits in Qrome + 1250 rate IST	Cry34/35Ab1 MCry3A	1250 IST
CRW traits in Vorceed Enlist	Cry34/35Ab1 Cry3Bb1 DvSnf7	250 IST

Figure 2. Emergence cage used to capture corn rootworm adults emerging from the soil.

RESULTS

- Corn rootworm pressure was high at the study locations in 2022 – the average node injury score in the unprotected checks was 1.99 on a 0-3 scale (Figure 3).
- The corn rootworm traits in Vorceed Enlist corn and Qrome corn + 1250 rate IST both provided effective protection of corn roots against corn rootworm damage.
- The corn rootworm traits in Vorceed Enlist corn and Qrome corn + 1250 rate IST both significantly reduced emergence of western corn rootworm compared to the unprotected check (Figure 3).

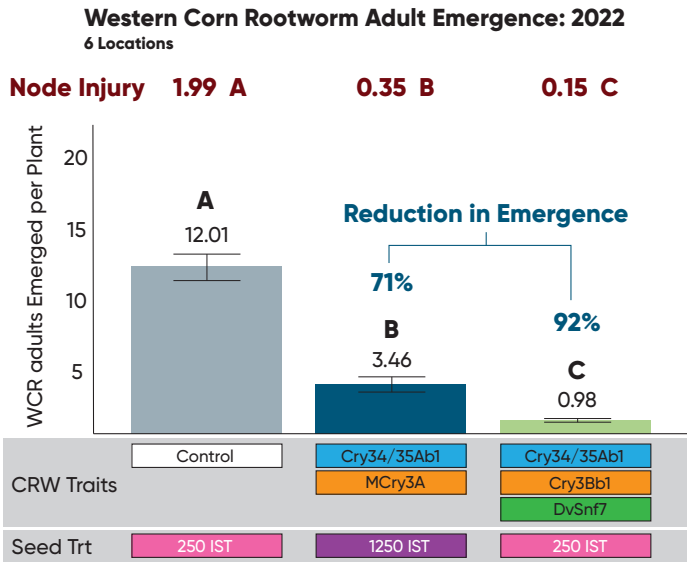

Figure 3. Western corn rootworm adult emergence (beetles/plant). Bars and values with the same letter are not significantly different at $\alpha = 0.05$.

- The addition of RNAi technology in the Vorceed™ Enlist® trait package provided a significant advantage in controlling adult emergence.
- The corn rootworm traits in Qrome® corn + 1250 rate IST reduced adult emergence by 71%, which is lower than would generally be expected over a larger range of environments and is reflective of the high rootworm pressure conditions that were specifically targeted for this study.
- Results of this study demonstrate the additional value provided by the RNAi technology in the Vorceed Enlist trait package for reducing adult emergence under the most extreme corn rootworm pressure conditions.

MANAGEMENT CONSIDERATIONS

- Corn rootworm challenges are localized and need to be managed on a field-by-field basis with a proactive, multi-year approach that employs multiple tactics to maintain low corn rootworm populations in the field.
- Historically, the use of crop rotation and insecticidal sprays targeting corn rootworm adult beetles have been the primary tactics growers could use to lower corn rootworm populations in fields.
- The RNAi technology in the Vorceed Enlist trait package provides another effective tool for managing the density of corn rootworm populations in fields in addition to protecting roots.
- Use of Vorceed Enlist Corn along with in-season beetle scouting should allow for the effective use of pyramided Bt rootworm products (without the RNAi trait) or non-rootworm corn treated with soil insecticide as options in the field in the subsequent season, extending the life of the RNAi technology.

CORN ROOTWORM BEST MANAGEMENT PRACTICES

1. Plant the Required Refuge

2. Rotate Crops

- Rotate at least every 3rd year in the following scenarios:
  - In long-term continuous corn system
  - CRW populations are high
  - Experiencing problems with CRW trait performance
- In areas where rotational-resistant CRW variants exist, CRW management options may be needed the following year.

3. Rotate Traits

- Use Bt hybrids with multiple modes of action for CRW control whenever possible.
- Use a non-Bt-traited hybrid with insecticide.

Manage CRW With Insecticides

- Adult CRW management considerations:
  - Scout fields for CRW adults during silking stage, as CRW adults feed on corn silks and may reduce yield.
  - Foliar sprays may be an option if CRW beetle populations reach an economic threshold for damage.
  - Follow university extension or local crop consultant recommendations for products, rates, and proper timing of adult spray applications for reducing CRW beetle populations.
- Larval CRW management considerations:
  - Soil-applied insecticides are not recommended for control of CRW in Bt-traited corn hybrids except under limited circumstances.
  - Consult with extension, crop consultants or other local experts for recommendations when considering a combination of CRW traits and soil applied insecticides.
  - Soil-applied insecticides should not be necessary for CRW control with pyramided CRW-traited Bt corn hybrids.

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