Factors affecting rootworm damage and soil insecticide performance in corn

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Managing corn rootworm in corn with soil insecticides is a different situation, often more complicated and uncertain, than applying most foliar sprays. Many factors impact the amount of damage that rootworms will cause in a given field. These factors help determine rootworm larval pressure, amount of root growth and regeneration, and insecticide performance. Some factors are favorable to rootworms, leading to high numbers of larvae that can overcome insecticide and severely prune roots. Other factors enhance or promote root growth and regeneration, or improve insecticide performance, reducing the potential for root damage. Rootworm management is not an exact science!

Cultural practices

Good soil fertility and nitrogen management: Improves plant vigor, root development, and root regeneration.

Tillage: Deeper tillage can reduce soil compaction and improve root development. Conversely, heavy soil residue can protect overwintering eggs and improve survival.

Weed control: Pro – reduces weed competition and improves corn growth; eliminates volunteer corn, which attracts rootworm adults and can lead to egg laying in soybean and other crops. Con – some herbicides (dinitroanilines) may prune roots so corn is more susceptible to rootworm damage or lodging in general.

Hybrids: No hybrids are resistant to rootworm, but some tolerate larval damage because they have a larger root mass or a better ability to regenerate roots. Field corn is often more tolerant than sweet or popcorn due to a larger root mass.

Planting date: Early planting = insecticide may break down before larvae emerge, reducing effectiveness of the treatment. Also, the larger root mass may actually allow more hatching larvae to survive early on. Late planting = fields are often silking later into the season. This attracts rootworm females, resulting in more egg laying and a potential problem the following year if corn is planted to the field.

Plant population: Higher density corn (over 30,000 plants per acre) may not have as good root development and regeneration, while at the same time providing more roots for hatching larvae to find early in the season.

Crop rotation: Rootworm females (except for the variant) lay their eggs in the soil of corn fields. The longer a field is planted to corn, the greater the rootworm problem. For most of Michigan, crop rotation still the most effective means of rootworm control.

Insecticide/application method

Insecticide formulation: Granules generally persist longer than liquids, and the active ingredient is less available for leaching or breakdown.

Timing of application: At-planting applications (in-furrow, banded, T-band) are generally more effective than applications at cultivation. Applications at cultivation often depend on rainfall or irrigation for activity, and on a critical interval of getting into the field just as rootworms are hatching. However, cultivation applications are applied closer to the time of larval hatch and have less time to degrade.

Proper calibration: Ensures correct amount of product going out. Too much product = waste of money, raises environmental concerns, and is an off-label application; too little = poor performance.

Drop tubes/banders: Check for plugged tubes and even-delivery of material.

Windshields: Research shows that wind can dramatically shift insecticide off-target during application. Install windshields to reduce this movement (broom type recommended over solid type to reduce turbulence).

Closing/press wheel: Seed furrow should be fully closed and seed is in good contact with soil. Reduces insecticide exposure to the elements and promotes faster germination.

Placement/incorporation: Optimum placement is at the depth of the seed. Thorough incorporation in the top inch of soil is key for many insecticides, and sometimes difficult to achieve under conditions of high residue.

Environment

Snow cover: Increases survival of eggs from previous year

Winter temperature: Warmer winters mean better egg survival, while freezing temps can kill eggs.

Spring weather: Cool spring temperatures can result in delayed egg hatch. This can extend rootworm activity and feeding beyond the time that insecticides are active, resulting in poor control. Cold springs can also delay corn growth and root development. Dry springs favor rootworm damage.

Soil type: Fine textured soils can inhibit larval movement so roots can't be located and larvae die. Insecticides move farther off-target in sandy soils with low organic matter. Iin soils with high organic matter, insecticides can become bound to the soil and unavailable to kill larvae.

Soil pH: Insecticides tend to break down faster in alkaline soils.

Soil moisture: Water is critical for activation and movement of many insecticides to the target pest. Too much water can leach the product off-target; too little water can inhibit

absorption of the insecticide by the larvae. On the positive side, wet soils can actually kill rootworms.

Take-home messages:

Rootworm damage depends on the interaction of many factors that determine rootworm larval pressure, root growth, root regeneration, and insecticide performance.

Soil insecticides reduce the survival of, but do not eliminate, rootworms from fields planted to continuous corn.

Untreated check strips should always be left in treated fields to evaluate insecticide performance via root ratings.

Lodging can occur for reasons other than rootworm feeding.

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