# Soil Applied Corn Rootworm Insecticides 101

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## Introduction

Using soil insecticides for control of corn rootworm larvae have been a common practice on continuous corn since the 1950s. However, the development of Bt CRW hybrids has raised concerns regarding use, efficacy and resistance. Particularly with newer crop advisors that are unaccustomed with their use.

## History

Corn rootworms have a history of insecticide resistance problems and good stewardship of currently labeled insecticides is recommended. The first confirmed case of western corn rootworm resistance was to the cyclodiene (Group 2a) insecticides in 1959. By the 1960s resistance to the cyclodienes was widespread and recommendations were adapted to include the carbamate (Group 1A) and organophosphate (Group 1B) insecticides.

These newer classes of insecticides are not known to have corn rootworm larval resistance problems. However, representatives of each class (carbofuran and isofenphos) were subject to enhanced microbial degradation and are no longer efficacious at controlling rootworm larvae. That is, the soil microbes used these pesticides as an energy source which reduced their concentration in the soil until they were no longer effective. Repeated use also conditioned the soil for even faster breakdown by microbes.

An alternative method of control which targeted adult beetles during the egg laying period did lead to insecticide resistance of carbaryl (Group 1A) and methy-parathion (Group 1B). Targeting adults was developed as an effort to reduce egg laying and hopefully reduce damage from subsequent larval generations. This approach requires accurate identification of both species, ability to distinguish between sexes, determine if females are gravid (have eggs present) while using all this information to determine the proper timing of a single foliar insecticide.

Research and development during the 1980-mid 1990s saw an abundance of insecticide research and develops which included new active ingredients, placements, formulations and delivery methods. However, genetically modified corn hybrids significantly slowed down development of insecticide discovery and research. Development of resistance to Bt hybrids has renewed interested in using soil insecticides for control of corn rootworms.

## Discussion

Several rules of thumb exist for providing consistent control from the currently labeled corn rootworm insecticides:

(1) **Chose products wisely**. Refer to university research data and field performance history to select products that consistently offer acceptable performance (nodal root ratings < 0.5 to 0.75). Soil applied insecticides do not control 100% of the larvae. In some years, high populations may overwhelm all rootworm control methods.

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(2) **Follow labeled instructions for rates, placement, etc**. Granular insecticides have a use rate based on oz/1000 row feet but also have limitations on the amount that can be used per acre. For example, a commonly used soil insecticide has a use rate of 6 to 8 oz/1000 row feed but also has a limit of 8.7 lb/acre. The latter label requirement limits row spacing to no less than 30 inches.

Research is not always clear on the best placement (T-band vs. in-furrow) of granular insecticides. However, labels may dictate the placement based on whether you are trying to control rootworm and/or white grubs, seed corn maggot, wireworms, cutworms, etc. Label restriction may also require specific placement based on slope, tillage practices and potential threat to endangered resources.

(3) **Calibrate, calibrate, calibrate**. Calibrating soil applied granular insecticides is just as important as calibrating liquid sprayers. On boom sprayers, each nozzle should be calibrated. The same should hold true on each row of your corn planter. The calibration charts supplied on labels are only a starting point. If you walk behind a corn planter and each granular applicator is set at the same setting you can be sure the planter was not calibrated. Planting speed has a major effect on granular insecticide application rates. Know your planting speed and keep it consistent while calibrating and planting.

(4) **Rotate soil insecticides**. Existing labeled granular insecticides are not known to have resistance issues with corn rootworms. Keep it that way. Rotating modes of action is just as important as with other pesticides to avoid resistance.

(5) **Scout for beetles**. Monitoring beetle numbers during the egg laying period can be a helpful method to select a field(s) that do not warrant treatment and those fields where seed treatments should be efficacious. It will also assist with selecting fields where either soil applied insecticides or Bt hybrids are appropriate.

(6) **Validate insecticide performance**. Rootworms do cause lodging but not all lodging is a result of corn rootworm feeding. Compaction, stalk rot, stalk boring insects, inadequate stalk strength, wind and rain are all possible causes. Do not assume lodged corn is a result of rootworm feeding. Dig corn plants (lodged or not), give them a through washing and rate them for damage after larval feeding is complete (late July or early August) to confirm performance.

(7) **Seed treatments**. Clothianadin and thiamethoxam are two active ingredients labeled for larval control. They also have the same mode of action. High rates of these neonicotinoid (Group 4A) seed treatments can be effective on low to moderate corn rootworm populations. Using under a high population scenario may result in unreliable control.

(8) **Organophosphate insecticide and ALS herbicide interaction**. Organophosate insecticides can have significant phytotoxic effects on corn if used before or after an ALS-inhibiting herbicide. Consult the label on all organophosphate insecticides, regardless of formulation, for specific use requirements. Some labels will strictly prohibit their use while others will give guidelines for safer use.

(9) **Nematicidal properties**. Do not assume insecticides will control or even suppress corn nematodes. Avicta Complete Corn (with additional thiamethoxam) and Counter are two insecticide/nematicides labeled for corn rootworm and corn nematodes.