2-8-2012

Effects of Seed Treatments and a Soil-applied Nematicide on Iowa Corn Yields and Nematode Population Densities—2011

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Abstract
Products that are currently available to manage plant-parasitic nematodes on corn in Iowa include the soil-applied insecticide/nematicide Counter® and two relatively new protectant seed treatments, Avicta® and Votivo®. Counter® is a contact and systematic nematicide with the active ingredient terbufos. Avicta® is a contact nematicide (active ingredient abamectin) that moves on the surface of the root, and Votivo® is a special strain of the natural soil bacterium *Bacillus firmus* that grows on the root. Counter® is available from AMVAC, Avicta® from Syngenta Seedcare, and Votivo® from Bayer CropScience.

Keywords
Plant Pathology and Microbiology

Disciplines
Agricultural Science | Agriculture | Plant Pathology

Integrated Crop Management NEWS

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Products that are currently available to manage plant-parasitic nematodes on corn in Iowa include the soil-applied insecticide/nematicide Counter® and two relatively new protectant seed treatments, Avicta® and Votivo®. Counter® is a contact and systematic nematicide with the active ingredient terbufos. Avicta® is a contact nematicide (active ingredient abamectin) that moves on the surface of the root, and Votivo® is a special strain of the natural soil bacterium *Bacillus firmus* that grows on the root. Counter® is available from AMVAC, Avicta® from Syngenta Seedcare, and Votivo® from Bayer CropScience.

Five experiments were conducted on ISU research farms in 2011 (figure 1) to assess and compare the nematode population densities and yields of corn growing in plots with and without the seed-treatment nematode protectants and the soil-applied nematicide Counter®.

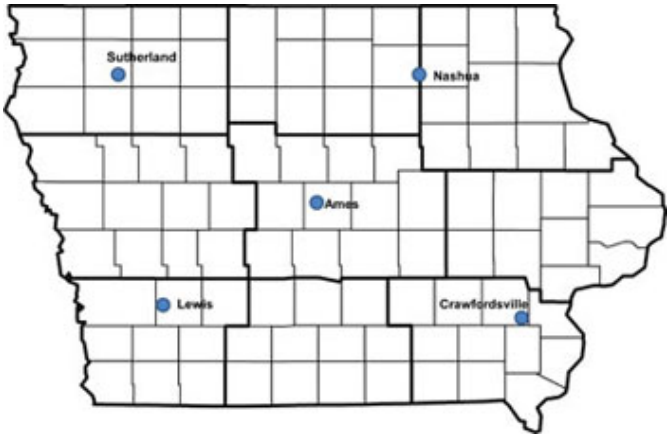

Figure 1. Locations of the experiments in 2011.

The experiments were conducted at the Northwest Research and Demonstration Farm (near Sutherland), the Northeast Research and Demonstration Farm (near Nashua), the Johnson Research Farm (near Ames), the Armstrong Memorial Research and Demonstration Farm (near Lewis), and the Southeast Research and Demonstration Farm (near Crawfordsville). The fields where the experiments were conducted were selected arbitrarily – not because they were known to have damaging population densities of nematodes that feed on corn.

The treatments in the experiments were:
1. Avicta® Complete Corn (Avicta® + Cruiser® + Maxim® Quattro)
2. Cruiser® + Maxim® Quattro
3. Counter® + Cruiser® + Maxim® Quattro
4. Poncho® (500) / VOTiVO® + Acceleron® fungicides
5. Poncho® 500 + Acceleron® fungicides

Treatments 1 and 2 varied only by the presence of Avicta®, treatments 2 and 3 varied only by the presence of Counter®, and treatments 4 and 5 varied only by the presence of Votivo®. The treatments were replicated four to six times in each experiment, and all treatments were applied to a single lot of seed of one 104-day corn hybrid. The experiment at the Armstrong Farm did not include treatment number 3, with Counter®.

Soil samples were collected from each plot to determine nematode population densities at or near the time of planting and again when the corn was at the V5 to V6 corn growth stage. Root samples also were collected at the V5 to V6 corn growth stage and nematode population densities inside the roots were determined. The plots were harvested and yields were calculated for each treatment.

ISU Extension field agronomists Terry Basol, Joel DeJong, Jim Fawcett, Mark Licht and Aaron Saeugling; and ISU research farm staff Kent Berns, Stephanie Marlay, Ken Pecinovsky, Ryan Rusk, Josh Sievers and Kevin Van Dee established, maintained and harvested the experiments and collected the nematode samples.

Nematode results

- There were no significant differences in numbers of plant-parasitic nematodes in the soil among the treatments at planting in any experiment or in the soil at the V5 to V6 corn growth stage in the experiments in northeast, southeast, and southwest Iowa.
- In the experiment in central Iowa, there were significant differences in total number of plant-parasitic nematodes in the soil among the treatments at the V5 sample date, with fewer total nematode numbers in the Counter® and Votivo® treatments (figure 2).
- In the experiment in northwest Iowa, spiral nematode numbers and total numbers of plant-parasitic nematodes in the soil were lower in the treatments with Avicta®, Counter®, and Votivo® and the Cruiser® + Maxim® Quattro treatment (minus Avicta®) than in the treatment with Poncho + Acceleron fungicides (minus Votivo®) (figure 3).
- The numbers of spiral, root-lesion, lance, dagger and pin nematodes in all experiments at planting and at the V5 to V6 corn growth stage were well below established damage thresholds for those nematodes.
- Very few nematodes were recovered from the root samples; those data were not used.

Corn yield results

- There were no significant differences in yield among the treatments at any of the five experiments.
- Overall mean yields for the experiments were 195 bushels per acre in northwest Iowa, 205 bushels per acre in northeast Iowa, 151 bushels per acre in central Iowa, 154 bushels per acre in southwest Iowa, and 129 bushels per acre in southeast Iowa.
- Corn yields were low in central, southwest and southeast Iowa experiments. There was some hail damage and gray leaf spot developed in the experiment in southwest Iowa. In the experiment in central Iowa, there were wind lodging problems later in the season, possibly related to poor stalk health.

Summary

The nematode management products did not consistently reduce numbers of plant-parasitic nematodes or corn yields in the experiments that were

conducted in 2011.

The low population densities of plant-parasitic nematodes that were present in the field did not affect corn yield in the experiments. The numbers and types of nematodes in the experiments were similar to those frequently found in samples submitted to Iowa State University for testing for nematodes that feed on corn from 2000-2010 (see ICM News article).

The nematode management products may have a much more pronounced beneficial effect in fields with very damaging nematode species (like needle nematodes) and in fields with much greater plant-parasitic nematode population densities.

For more detailed information about the methods used and results of the experiments, contact the first author or consult the 2011 annual reports of the ISU Research and Demonstration Farms.

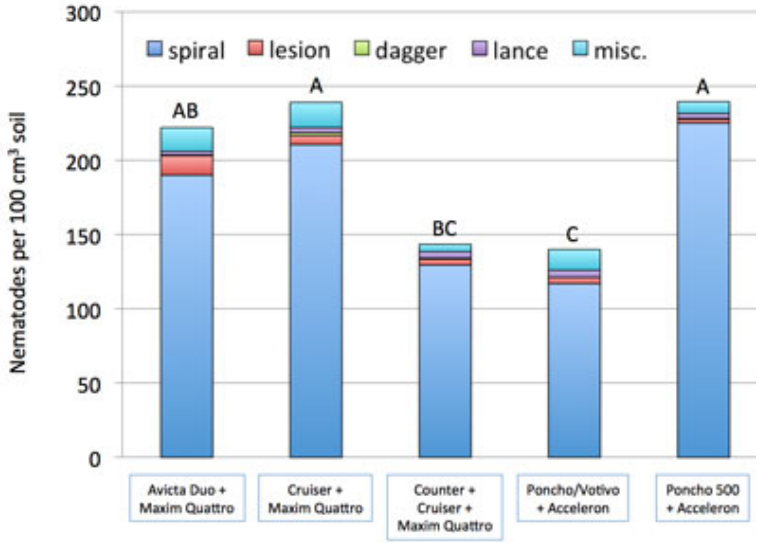

Figure 2. Mean number of plant-parasitic nematodes in soil samples collected at the V5 corn growth stage in the experiment in central Iowa (near Ames) in 2011. "misc." = miscellaneous plant-parasitic nematodes present in very low numbers. Bars with different letters above them had significantly different total numbers of plant-parasitic nematodes (P=0.10).

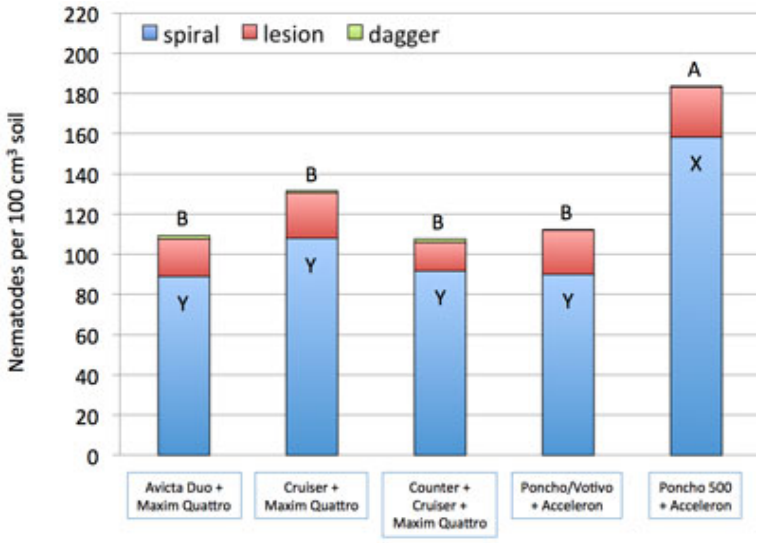

Figure 3. Mean number of plant-parasitic nematodes in soil samples at the

V6 corn growth stage in the experiment in northwest Iowa (near Sutherland) in 2011. Bars or segments of bars with different letters are significantly different (P=0.10).

Greg Tylka is a professor with extension and research responsibilities in management of plant-parasitic nematode. Mychele Batista da Silva is a graduate student in the Department of Plant Pathology and Microbiology at Iowa State University.

This article was published originally on 2/8/2012 The information contained within the article may or may not be up to date depending on when you are accessing the information.