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

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Abstract
Plant-parasitic nematodes are microscopic worms that feed on plants. Almost every nematode that feeds on corn is capable of feeding on many other plants. These nematode parasites are thought to be native to most Iowa soils and to have fed upon native plants before corn was grown as a cultivated crop. Population densities (numbers) of most species of plant-parasitic nematodes that feed on corn have to increase to damaging levels (called damage thresholds) before yield loss occurs.

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Introduction

Plant-parasitic nematodes are microscopic worms that feed on plants. Almost every nematode that feeds on corn is capable of feeding on many other plants. These nematode parasites are thought to be native to most Iowa soils and to have fed upon native plants before corn was grown as a cultivated crop. Population densities (numbers) of most species of plant-parasitic nematodes that feed on corn have to increase to damaging levels (called damage thresholds) before yield loss occurs.

Products that are currently available to manage plant-parasitic nematodes on corn in the state 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 with the 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.

The objective of this experiment was 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®.

Materials and Methods

The experiment was conducted on the ISU Northeast Research Farm, Nashua, Iowa. There were six replications of five different treatments. Plots consisted of 18 rows, spaced 30 in. apart and 65 ft long. The experiment was planted on April 25 and harvested on September 21, 2012. Soil samples for nematode analyses were collected on April 26 and then again, with root samples, on June 5-6, 2012, when the corn crop was at the V6 growth stage. Soil samples consisted of 20 one-inch-diameter cores that were 12 in. deep collected from under the seed row of the center four rows of each plot. The nematodes were extracted from the soil and root samples, and plant-parasitic nematodes were identified to genus and counted. The treatments, all applied to a single lot of seed of a single corn hybrid, were:

1. Avicta® Complete Corn (which is 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® and are labeled "w/ Avicta®" and "w/o Avicta®" in Figure 1. Similarly, Treatments 2 and 3 varied only by the presence of Counter® and are labeled "w/o Counter®" and "w/ Counter®" and Treatments 4 and 5 varied only by the presence of

Votivo® and are labeled "w/ Votivo®" and "w/o Votivo®."

Results and Discussion

The primary plant-parasitic nematodes found in the experiment were the spiral (*Helicotylenchus*) and root-lesion (*Pratylenchus*) nematodes. Dagger (*Xiphinema*) and lance (*Hoplolaimus*) nematodes and *Aphelenchus* spp. also were found at very low numbers and were combined into the category of "miscellaneous." Spiral nematode was the most numerous (Figure 1). At planting, there were no significant differences in numbers of individual nematode types or in total number of plant-parasitic nematodes among treatments.

Very few nematodes were recovered from the root samples collected when the corn was at the V6 growth stage, so those data were not included. In the soil samples collected at V6, there were fewer nematodes found in each sample than were present at the time of planting (Figure 1), which was unusual. There were no significant differences in numbers of individual nematode types or in total number of plant-parasitic nematodes among treatments at V6.

The overall average yield of the corn in the experiment was 159.9 bushels/acre. Average yields for the five treatments ranged from 157.0 to 162.6 bushels/acre, with no significant differences in yield among treatments.

Summary

The nematode management products had no effect on corn yields in the experiment. The effectiveness of the nematode management products may be much more pronounced in fields with very damaging nematode species (like needle and sting nematodes) and in fields with much greater plant-parasitic nematode population densities.

Acknowledgements

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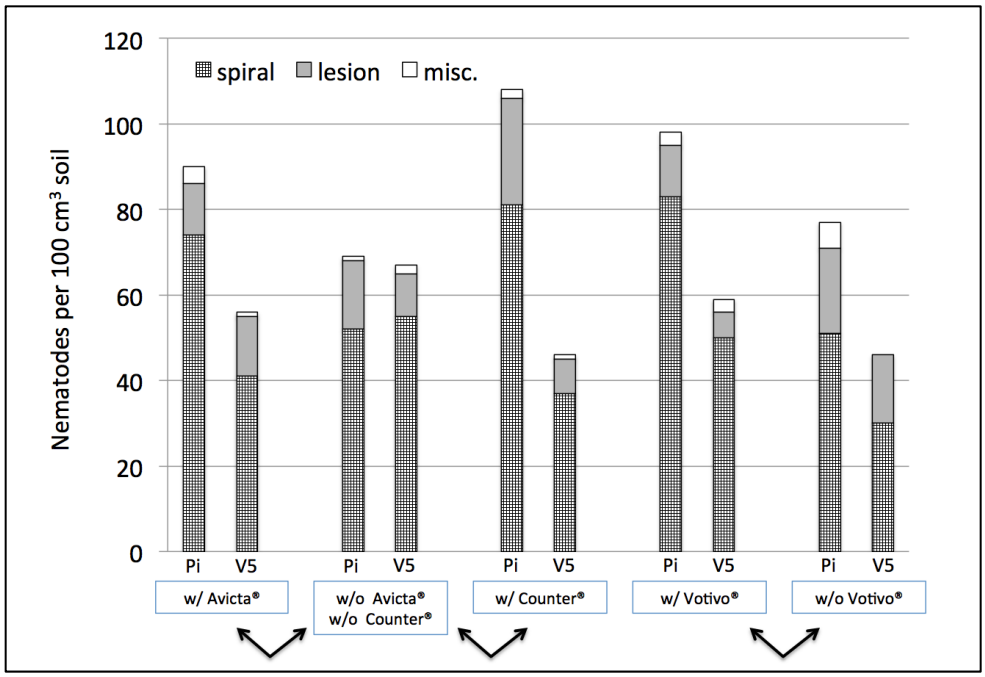

Figure 1. Mean population densities of plant-parasitic nematodes in soil samples at planting ("Pi") and at the V6 corn growth stage for the five treatments studied in the experiment. All nematode numbers were less than the numbers needed to significantly reduce corn yields. "misc." = miscellaneous plant-parasitic nematodes present in very low numbers. There were no significant differences (P > 0.10) in numbers of nematodes among treatments for the samples collected near the time of planting (Pi) or when corn was at the V6 growth stage.