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

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

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.

Keywords

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Disciplines

Agricultural Science | Agriculture | Plant Pathology

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

RFR-A1148

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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 (active ingredient abamectin) that moves on the surface of the root, and Votivo is a special strain of the natural soil bacterium *Bacillus firmis* that grows on the surface of 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 Northwest Research and Demonstration Farm. There were six replications of five different treatments. Plots consisted of eight rows, spaced 30 in. apart and 94 ft long. The experiment was planted on May 3 and harvested on October 17, 2011. Soil samples for nematode analyses were collected on May 5 and then again, with root samples, on June 9, 2011, 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[®], Treatments 2 and 3 varied only by the presence of Counter[®], and Treatments 4 and 5 varied only by the presence of Votivo[®].

Results and Discussion

The primary plant-parasitic nematodes found in the field were the dagger (*Xiphinema*), lesion (*Pratylenchus*), and spiral (*Helicotylenchus*) nematodes. 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 in June, so those data were discarded. In the soil samples collected in June, there were significantly more spiral nematodes and total plant-parasitic nematodes in the Poncho® 500 + Acceleron® fungicide treatment than the other four treatments. But all nematodes in samples collected at planting and at V6 corn growth stage were well below numbers thought to cause yield loss to corn.

The overall average yield of the corn in the experiment was 195.2 bushels/acre. Mean treatment yields ranged from 194.6 to

196.1 bushels/acre, and there were no significant differences in yield among treatments.

Summary

- Corn yields were not affected by the low population densities of plant-parasitic nematodes that were present in the field.
- 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.

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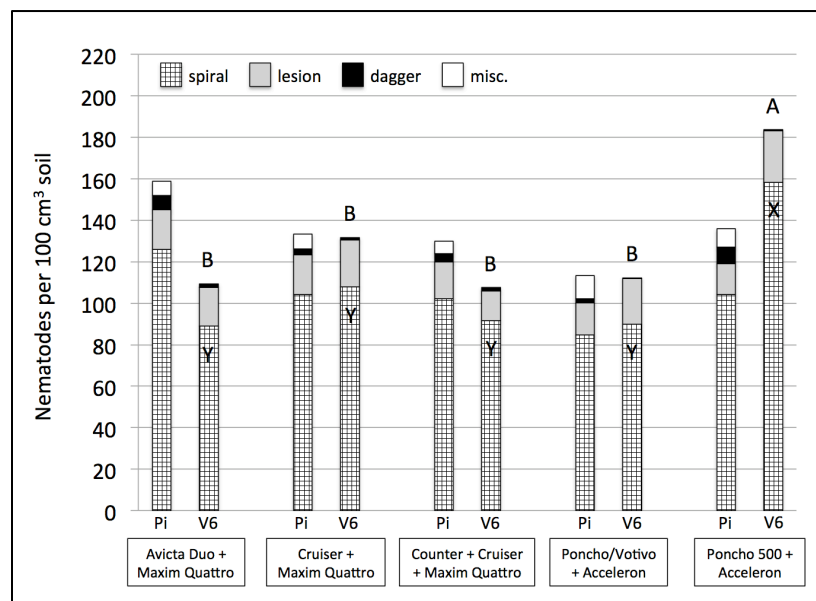


Figure 1. Mean population densities of plant-parasitic nematodes in soil samples at planting (initial population density or Pi) and at V6 corn growth stage for the five treatments investigated in the experiment. Misc. = miscellaneous plant-parasitic nematodes present in very low numbers. For the Pi (at planting) and V6 sample dates separately, bars or segments of bars with different letters are significantly different ($P=0.10$).