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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.

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 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[®].

Keywords

RFR A11137, Plant Pathology and Microbiology

Disciplines

Agriculture | Agronomy and Crop Sciences | Plant Pathology

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

RFR-A11137

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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.

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Materials and Methods

The experiment was conducted on the ISU Johnson Farm in central Iowa. There were four replications of five different treatments. Plots consisted of eight rows, spaced 30 in. apart, and 180 ft long. Yield and nematode data were collected from the center four rows in each plot. The experiment was planted on May 6 and harvested on October 18, 2011. Soil samples for nematode analyses were collected May 9 and then again, with root samples, on June 7, 2011, when the corn crop was at the V5 growth stage. Soil samples consisted of 20, 1-in.-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
- 6.

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*), lance (*Hoplolaimus*), 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 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 fewer total plant-parasitic nematodes in the Counter[®] and Votivo[®] treatments than in the comparison treatments that did not have the nematode management products (Figure 1). But all nematodes in samples collected at planting and at V5 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 151 bushels/acre. Mean treatment yields ranged from 140 to 159 bushels per acre, and there were no significant differences in yield among treatments.

Summary

- At the June sample date (V5 corn growth stage), there were fewer plant-parasitic nematodes in the Counter[®] and Votivo[®] treatments than in the comparison treatments.
- Corn yields were low, probably because the hybrid was not well suited for the area.
- There was no effect of the nematode management products on corn yields.
- There were low population densities of plant-parasitic nematodes present in the field, which too low to significantly reduce corn yields.
- The nematode management products may have a much more pronounced effect in fields with very damaging nematode species (like needle nematodes) and in fields with much greater plant-parasitic nematode population densities.

Acknowledgements

We thank AMVAC for donating the Counter[®] and Bayer CropScience and Syngenta Seedcare for donating the seed treatments used in this research. No endorsement is intended of the products used in the experiment, nor is criticism implied of products not included in the research.

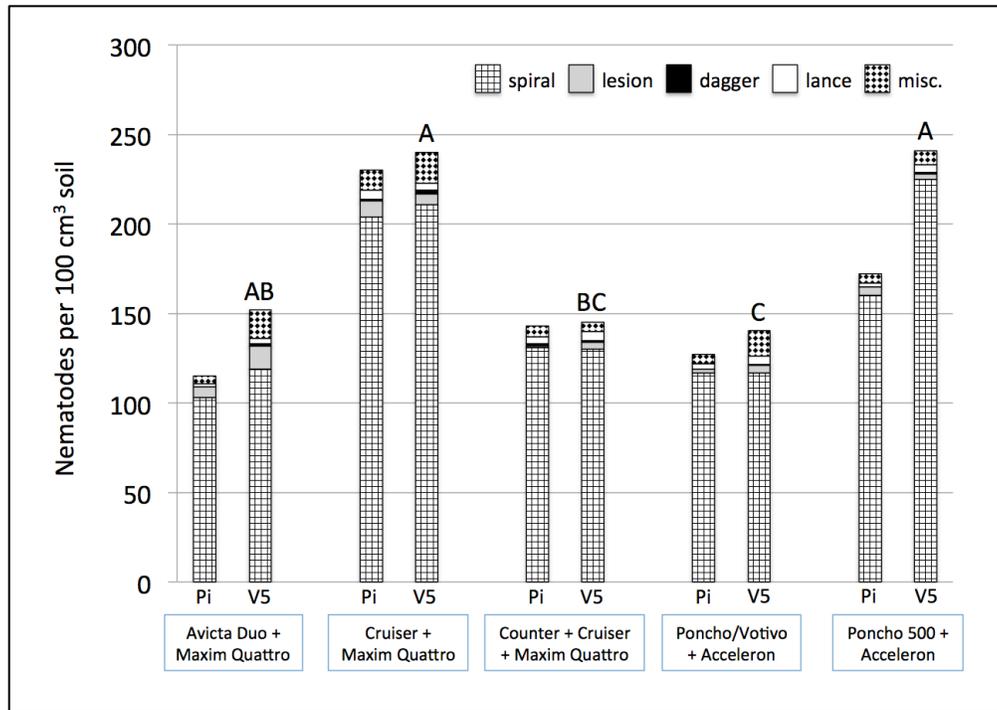


Figure 1. Mean population densities of plant-parasitic nematodes in soil samples at planting (“Pi”) and at V5 corn growth stage. All nematode numbers were too low to significantly reduce corn yields. For the V5 sample date, bars with different letters above them had significantly different total numbers of plant-parasitic nematodes ($P=0.10$); there were no significant differences among treatments for the initial (Pi) samples ($P>0.10$).