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

Gregory L. Tylka

Iowa State University, gltylka@iastate.edu

Mychele Batista Da Silva

Iowa State University, mbsilva@iastate.edu

Kevin Van Dee

Iowa State University

James A. Fawcett

Iowa State University, fawcett@iastate.edu

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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 on 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

RFR A1173, Plant Pathology and Microbiology

Disciplines

Agricultural Science | Agriculture | Plant Pathology

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

RFR-A1173

Gregory Tylka, professor
 Mychele Batista da Silva, graduate student
 Department of Plant Pathology and
 Microbiology
 Kevin Van Dee, farm superintendent
 Jim Fawcett, extension field agronomist

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 on 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[®].

Materials and Methods

The experiment was conducted at the ISU Southeast Research and Demonstration Farm, Crawfordsville, IA. There were six replications of five different treatments. Plots consisted of eight rows, spaced 30 in. apart, and 175 to 325 feet long. Data were collected from a four-row-wide (10 ft) by 100-ft-long area in each plot. The experiment was planted on May 2 and harvested on September 27, 2011. Soil samples for nematode analyses were collected on May 17 and 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

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[®].

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

Results and Discussion

The primary plant-parasitic nematodes found in the field were the lesion (*Pratylenchus*), pin (*Paratylenchus*), 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 no significant differences in numbers of individual nematode types or in total number of plant-parasitic nematodes among treatments. 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 129 bushels/acre. Mean treatment yields ranged from 124 to 132

Summary

- The nematode management products did not affect numbers of plant-parasitic nematodes or corn yields in the experiment.
- Corn yields were very low in the experiment; the hybrid used was not well suited for the field where the experiment was conducted.
- The low population densities of plant-parasitic nematodes that were present in the field did not affect corn yield.
- 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 and applying the seed treatments. No endorsement is intended of the products used in the experiment, nor is criticism implied of products not included in the research.

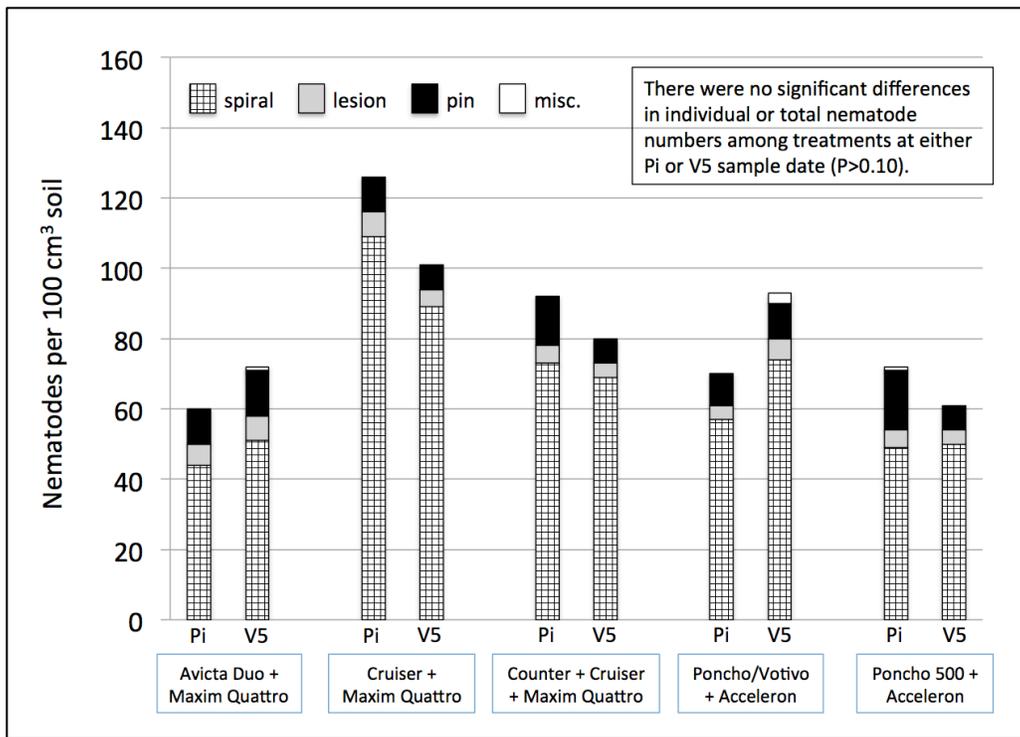


Figure 1. Mean population densities of plant-parasitic nematodes in soil samples at planting (initial population density or Pi) and at V5 corn growth stage for the five treatments investigated in the experiment. Misc. = miscellaneous plant-parasitic nematodes present in very low numbers.