How Are Nematodes Impacting My Corn Crop?

Summary

- Corn nematodes can reduce corn yield potential without visible symptoms.
- Nematodes can feed on the surface of the roots (ectoparasite) or within the roots (endoparasite) depending up on the species.
- Soil and root samples are required to determine nematode presence as well as species identification.

Introduction

Estimating yield loss due to nematode infestations can be difficult. Though yields may have been excellent, top-end yield potential may have been reduced because nematode feeding restricted nutrient uptake that could have increased yield potential. In 2022, the estimated losses to nematodes in the United States and Ontario, Canada were 54.2 million bushels.[1] Individual nematode species vary regarding their damage potential. As an example, needle and sting nematodes can cause extreme damage when there is only one nematode per 100 cubic cm (cm^3) of soil. Table 1 shows damage thresholds for different nematode species. It is important to understand that these are damage thresholds only and are NOT calibrated on a response to a nematode control product.

Corn growing under very good to excellent environmental conditions can be plagued with nematode feeding; however, symptoms may not be apparent, which sets the stage for hidden yield loss. Below is the complied list of above and below-ground symptoms caused by nematodes that can be confused with other agronomic factors (disease, fertility, insect, or herbicide injury).[4]

*Table 1. Corn Nematodes, Estimated Thresholds, Habitat, and Primary Soil Type**

Common Name	Threshold (100 CM^3 SOIL)	Soil or Root Habitat	Primary Soil Type
Dagger	30 to 40[2]	Ectoparasite (Soil)	Sandy
Lance	60[3]	Endoparasite (Roots)	Sandy
Needle	1[2,3]	Ectoparasite (Soil)	Very sandy
Pin	Unknown	Ectoparasite (Soil)	
Ring	100[2,3]	Ectoparasite (Soil)	Sandy
Root-knot	100[3]	Endoparasite (Roots)	
Root-lesion	200[3]	Endoparasite (Roots)	
Sheath	Unknown	Ectoparasite (Soil)	
Spiral	500 to 1000[2]	Ectoparasite (Soil)	Clay or loam
Sting	1[2,3]	Ectoparasite (Soil)	Very sandy
Stubby root	40[3]	Ectoparasite (Soil)	Sandy
Stunt	100[2]	Ectoparasite (Soil)	

*Adapted from: Common corn nematode Characteristics. Integrated Crop Management. Iowa State University[2] and Guide for interpreting nematode assay results. Circular 834. University of Georgia Extension[3].

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Above-ground Signs[4]

- Thin stands
- Stunted plants
- Uneven plant height
- Uneven tasseling
- Leaf yellowing
- Small ears and kernels

Below-ground Signs[4]

- Swollen roots
- Black or dark brown dead spots on roots (necrotic lesions)
- Limited fine roots and branches (Figure 1)

Root and soil sampling is the only way to determine the presence of damaging nematode populations in a field. Soil and root samples are required because some nematodes live within the roots (endoparasites) and others live only in the soil and feed externally on the roots (ectoparasites).Field history and soil type play a huge role when soil sampling for nematodes. If a field has a known nematode history, then sampling timing can be dictated by the previously identified species. However, because of cooler soil temperatures, early-season sampling is generally recommended because nematodes are more likely to be closer to the surface.

If the field is at least 80% sand, sampling should be conducted prior to the V6 growth stage (6 leaves with exposed collars) because sting and needle nematodes can go several feet deep when the temperature in sandy soil increases. Regardless of soil type, if sampling is completed early in the season (by V6), 4 to 6 plants should be dug with roots intact. Collected samples should be representative of 40 acres or less. However, if nematodes are suspected in identifiable problem areas, soil samples should be collected from the problem and the non-problem area for comparison.

Figure 1. Sting nematode damage to corn roots. Picture courtesy of and used with the permission of Clemson University-USDA Cooperative Extension Slide Series, Bugwood.org

Sampling Procedures for Sandy Fields[5]

- Sample the perimeter of large, suspected areas instead of the center.
- The root zone should be probed 6 to 8 inches deep at an angle.
- About 20 soil core samples should be collected and mixed to get at least a two-cup sample.
- Double bag soil and plants separately in sealable zipper-top plastic bags.
- Samples should be handled gently to help avoid damaging nematodes.
- Refrigerate samples until shipping.
- Pack samples in a leak-proof container with soft packing material.
- Complete a submission form for the respective diagnostic laboratory.
- Samples should be shipped early in the week.
- Nematodes must be alive for proper analysis.

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Sampling Procedures for Non-Sandy Soil Type Fields[5]

- If sampling is completed by V6 growth stage, 4 to 6 plants should be collected by digging the roots carefully.
- If sampling after V6, no additional roots are necessary providing soil cores are collected from the root zone.
- Collected samples should be representative of 40 acres or less. If nematodes are suspected in identifiable problem areas, soil samples should be collected from the problem and the non-problem area for comparison.

Nematode Management

There are two management strategies for damaging nematode populations: 1) crop rotation with non-host crops and 2) using available soil-applied nematicides to keep the population under check. There are no rescue treatments available. One yield-protection estimate for the use of a nematicide when damaging populations of root-knot, stubby-root, and sting nematodes are present is 10 to 40 bu/acre or more.[6]

Sources:

[1]Mueller, D. Wise, K. and Sisson, A. 2023. Corn disease loss estimates from the United States and Ontario, Canada – 2022. Crop Protection Network. https://cropprotectionnetwork.org/publications/corn-disease-loss-estimates-from-the-united-states-and-ontario-canada-2022).

[2]Tylka, G. 2009. Common corn nematode Characteristics. Integrated Crop Management. Iowa State University. https://crops.extension.iastate.edu/cropnews/2009/08/common-corn-nematode-characteristics

[3]Jagdale, G. and Brewer, C.L. 2013. Guide for interpreting nematode assay results. Circular 834. University of Georgia Extension. https://extension.uga.edu/publications/detail.html?number=C834

[4]Tylka, G. 2007. Nematodes in corn production: A growing problem? Integrated Crop Management.

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https://cropwatch.unl.edu/corn-nematode-sampling

[6]Lee, R.D. (editor), Noland, R., Harris, G., Porter, W., Prostko, E., Buntin, D., Kemerait, B., Sumner, P., Toews, M., Rabinowitz, A., and Smith, A. 2019. A guide to corn production in Georgia. Corn disease and nematode management update for 2019. Pg. 100. Georgia Agricultural Commodity Commission for Corn. University of Georgia Extension.
https://grains.caes.uga.edu/content/dam/caes-subsite/grains/docs/corn/2019-Corn-Production-Guide.pdf

Additional Source: Tylka, G. 2009. Quick facts about corn nematodes. Integrated Crop Management.
https://crops.extension.iastate.edu/cropnews/2009/04/quick-facts-about-corn-nematodes

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