How are Nematodes Impacting My Corn Crop in Season?

// Corn nematodes can reduce corn yields without obvious symptoms.

// Depending on the nematode species, feeding occurs on the surface of the roots (ectoparasite) or within the roots (endoparasite).

// Soil and root samples are required for determining if nematodes are present and species identification.

Estimating yield loss due to nematode infestations can be difficult. Though yields may have been excellent, top-end yield potential may not have been achieved because nematodes removed plant nutrients that could have increased yield. A 2012 study estimated that 81.5 million bushels of corn were lost due to nematode feeding in the top 22 U.S. corn states and Ontario, Canada.[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. Above and below-ground feeding symptoms that can be confused with other agronomic factors (disease, fertility, insect or herbicide injury) include:[4]

Above-ground Signs

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

Below-ground Signs

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

Table 1. Corn Nematodes and Estimated Damage Thresholds

COMMON NAME	GENUS	THRESHOLD (100 CM^3 SOIL)	PRIMARY SOIL TYPE
Dagger	*Xiphinema*	30 to 40[2]	Sandy
Lance	*Hoplolaimus*	60[3]	Sandy
Needle	*Longidorus*	1[2,3]	Very sandy
Pin	*Paratylenchus*	Unknown	
Ring	*Criconemella*	100[2,3]	Sandy
Root-knot	*Meloidogyne*	100[3]	
Root-lesion	*Pratylenchus*	200[3]	Roots
Sheath	*Hemicycliophora*	Unknown	
Spiral	*Helicotylenchus*	500 to 1000[2]	Clay or loamy
Sting	*Belonolaimus*	1[2,3]	Very sandy
Stubby-root	*Paratrichodorus*	40[3]	Sandy
Stunt	*Tylenchorhynchus*	100[2]	

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Figure 1. Sting nematode damage to corn roots. Clemson University-USDA Cooperative Extension Slide Series, Bugwood.org

The only way to definitively determine if damaging nematode levels are present in a field is to take soil and root samples. 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 are factors to consider when soil sampling for nematodes. If there is a known nematode history in a field, sampling timing can be dictated by the previously identified species. However, early-season sampling is generally recommended because nematodes are more likely to be closer to the surface because of cooler soil temperatures.

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.

Additional Sampling Procedures:[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 2-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

Nematode Management

Should damaging populations of nematodes be discovered, there are two strategies for management – rotation to non-host crops and using available soil-applied nematicides. 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 (verified 6/21/19):

[1]Mueller, D. (Compiled by) & Wise, Kiersten (Published by). 2014. Corn disease loss estimates from the United States and Ontario, Canada – 2012. Diseases of Corn. Purdue Extension publication BP-96-12-W. Daren Mueller is associated with Iowa State University and Kiersten Wise is associated with Purdue University. https://www.extension.purdue.edu/.

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

4Tylka, G. 2007. Nematodes in corn production: A growing problem? Integrated Crop Management. (IC-498) (1) Iowa State University. https://crops.extension.iastate.edu/.

[5]Jackson-Ziems, T. 2015. Corn nematode sampling. CROPWATCH. University of Nebraska-Lincoln. https://cropwatch.unl.edu/.

[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/.

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

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