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KEY POINTS:

- Nematodes may be overlooked as a pest in corn due to their small size and non-distinctive damage symptoms, but they can cause yield loss by damaging corn roots.
- Many different nematode species can cause yield loss in corn. Damage in a field can be caused by a single species or by several species.
- Lumialza™ nematicide seed treatment is a biological treatment available with corn products with activity against all major corn nematode species.

NEMATODES: AN OVERLOOKED PEST OF CORN

- More than 50 species of nematodes are known to feed on corn in the U.S., several of which can cause economic damage.
- Corn nematodes are commonly thought of as a pest specific to sandy soils, such as in Kansas and Nebraska, and the coastal plains of North and South Carolina. While this is true of some species, other species can exist in a range of soil conditions.
- Nematodes normally do not kill plants but act as parasites on the host plant.

ARE NEMATODES BECOMING MORE COMMON?

- Recent trends in farming practices may be increasing nematode numbers as well as their economic impact in corn.
 - Reduced tillage is known to favor some nematode species, as is corn following corn.
 - Reduced use of carbamate and organophosphate insecticides for rootworm control has likely caused an increase in nematode populations. These insecticides have activity against nematodes, whereas newer alternatives, such as pyrethroid insecticides and CRW Bt corn, do not.
- Our ability to sample and diagnose nematode damage has also improved. Symptoms that may have once been attributed to other factors are now correctly being traced to nematodes.

CROP DAMAGE

- Plant parasitic nematodes are typically soil-borne and feed on plant roots. Nematodes use a stylet to pierce the corn root and extract nutrients.
- Tissue damage at the feeding site can provide easy entry into the root system for commonly associated root pathogens.
- Nematode damage can occur throughout the growing season; however, corn is most vulnerable during early-season crop establishment.

VISUAL SYMPTOMS IN CORN

- Visual symptoms usually show up as “hot spots” in the field.
- Plants may appear to be moisture-stressed, stunted and chlorotic, or exhibit less-extreme signs of poor plant growth.
- Symptoms are often mistaken for another problem, such as low fertility, soil compaction, weather stress, or insect damage.
- No specific patterns are usually identifiable with nematode damage, although as the problem grows, it often moves in the direction of field tillage.
- Root pruning is usually evident, as well as proliferation of fibrous roots, thickening or swelling of the smaller roots, and mild to severe discoloration.
- Soil may stick to the roots due to the oozing of damaged cells.



Figure 1. A lesion nematode, one of the more ubiquitous nematode pests of corn (left). Severe feeding damage from lance nematodes (right).

PRIMARY CORN NEMATODE SPECIES

- There are many species of nematodes with different biological characteristics that are capable of reducing corn yield. Different soil environments will favor different nematode species.
- It is difficult to establish widely applicable economic thresholds for nematode populations given their tendency for patchy distribution and other stress factors that can influence yield.
- Scientists at Corteva Agriscience have developed high population indicators for corn nematode species as a relative measure of low, medium, or high population levels (Table 1).
- The foundation of these indicators is university and nematologist thresholds plus yield results from Corteva research trials. The purpose of the high population indicator is to simplify characterization of nematode population levels while taking into account varying thresholds across states.

MANAGING CORN NEMATODES

- Sampling conducted by Corteva agronomists across hundreds of locations has shown that potentially damaging levels of corn nematode populations are prevalent throughout corn production areas in the U.S. (Gumz, 2020).
- If damaging levels of corn nematodes are found, implementing control measures, such as rotation, sanitation, or use of nematicide seed treatments, should be considered.
- Nematode species vary in their host range, so rotation can be effective for reducing populations of some, but not all, corn nematode species.

- Many corn products are available with a seed treatment option for nematode control:
 - Lumialza™ nematicide seed treatment is a biological product that contains the active ingredient *Bacillus amyloliquefaciens* – Strain PTA-4838 and has activity against all primary corn nematode species.
 - National trials have shown yield improvements of 3.7 bu/acre under low pressure and up to 9 bu/acre in high pressure fields.³
 - Research has shown that nematode protection lasts for more than 80 days in the upper, middle, and lower root zones.

Table 1. Corn nematodes of economic importance in North American corn production.

Common Name	Genus	Damage Rating	Prevalence	Soil Type	High Population Indicator	Notes
Sting	<i>Belonolaimus</i>	Very damaging	Occasional in Corn Belt, common in coastal and plains states	Sandy	1 per 100 cm ³ of soil	Ectoparasitic. Severe stunting and chlorosis. Small, coarse, devitalized root system. Wide host range.
Needle	<i>Longidorus</i>	Very damaging	Occasional	Sand and loamy sand. Occasionally in finer soils	1 per 100 cm ³ of soil	Ectoparasitic. Causes stubby roots and can kill corn plants. Rotation can help reduce populations.
Lance	<i>Hoplolaimus</i>	Moderate	Occasional	Many types; varies by species	50 per 100 cm ³ of soil	Endoparasitic. Reduces root system. Darkened and discolored roots. Moderate stunting and chlorosis.
Stubby-root	<i>Paratrichodorus</i>	Moderate	Common	Many types	50 per 100 cm ³ of soil	Ectoparasitic. Severe stunting and chlorosis. Stubby lateral roots. Wide host range.
Root-knot	<i>Meloidogyne</i>	Damaging with high populations	Common	Many types; worse with sandy soils	50 per 100 cm ³ of soil	Sedentary endoparasitic. Form galls on the roots. Affected plants appear stunted and water or nutrient deficient.
Dagger	<i>Xiphinema</i>	Moderate	Occasional	All types; worse with sandy soils	100 per 100 cm ³ of soil	Ectoparasitic. Kill root tips. Sensitive to tillage. Severe stunting and chlorosis.
Lesion	<i>Pratylenchus</i>	Moderate	Very common	All types	150 per 100 cm ³ of soil	Migratory endoparasitic. Most damaging in corn. Cause smaller root systems that are dark and discolored.
Ring	<i>Criconemoides</i>	Low	Common	Sandy	200 per 100 cm ³ of soil	Sedentary ectoparasitic.
Stunt	<i>Tylenchorhynchus</i>	Low	Common	More common in heavier soils	300 per 100 cm ³ of soil	Ectoparasitic. Moderate stunting and chlorosis. Reduced root system.
Spiral	<i>Helicotylenchus</i>	Low	Common	More common in heavier soils	500 per 100 cm ³ of soil	Ectoparasitic. Mild stunting. Smaller than normal root system. Root decay.
Pin	<i>Gracilacus, Pratylenchus</i>	Low	Occasional	Fine-textured soils		Sedentary ectoparasitic. May contribute to yield loss in conjunction with other nematode species.
Sheath	<i>Hemicycliophora</i>	Low	Rare			Sedentary ectoparasitic.

Gumz, M. 2020. Corn Nematode Populations in the Corn Belt and Southeastern U.S. Pioneer Agronomy Research Update. Vol 10 No. 11. <https://www.pioneer.com/us/agronomy/Potentially-Damaging-Corn-Nematode-Populations-Found-Corn-Belt-Southeast-US.html>

*Data is based on 10-state broad-acre head-to-head strip trial comparing Lumialza™ nematicide seed treatment vs. non-nematicide seed treatment utilizing the same insecticide and fungicide recipe in seed-applied technology replicated and strip trial data. Yields ranged from 3 to 9 bu/A depending on nematode species and population, in 184 low stress and 54 moderate to high stress locations.



The foregoing is provided for informational use only. Please contact your sales professional for information and suggestions specific to your operation. Product performance is variable and depends on many factors such as moisture and heat stress, soil type, management practices and environmental stress as well as disease and pest pressures. Individual results may vary. CF210614 | June 2021