

Nematodes

Lance (Hoplolaimus) (enhanced by continual Mocap use)	endoparasitic
Sting (Belonlaimus) (root stunting)	ectoparasitic
Sheathoid (Hemicriconemoides)	ectoparasite
Spiral (may favor paspalum) (Helicotylenchus, Peltamigratus) (Salt tolerant)	endoparasitic
Ring (Mesocriconema)	ectoparasitic
Root-knot (salt tolerant) (Meloidogyne graminis or marylandi)	sedentary endoparasitic
Stunt (salt tolerant) (Tylenchorhynchus)	ectoparasitic
Dagger (salt tolerant) (Xiphinema & Longidorus spp.)	ectoparasitic
Needle (salt tolerant) (Longidorus)	ectoparasitic
Sheath (Hemicyclophora)	ectoparasitic
Pin (Paratylenchus spp.)	ectoparasitic
Awl (Dolichondorus)	ectoparasitic
Stubby-root (Paratrichodorus & Trichodorus spp.)	endoparasitic
Cyst (Heterodera & Globodera spp.)	sedentary endoparasitic
Lesion (Pratylenchus)	migratory endoparasitic
Spiral (Scutellonema & Helicotylenchus spp.)	endoparasitic
Stem & Bulb (Ditylenchus spp.)	migratory endoparasitic
Burrowing (Radopholus spp.)	migratory endoparasitic
Citrus (Tylenchulus spp.)	sedentary endoparasitic

Reniform (Rotylenchulus spp.)

sedentary endoparasitic

**New: False Root-Knot (Nacobbus aberrans) (Crop Protection 52:97-102. 2013);
unknown colonization of turfgrass ecosystems**

Ectoparasitic: live outside the plant and pierce the plant cells with their stylet to feed

Migratory endoparasitic: live and feed inside the plant, migrating through the plant tissues

Sedentary endoparasitic: live and feed inside the plant, inducing specialized fixed feeding sites called giant cells, syncytia or nurse cells in susceptible plants

Beneficial species: Dorylaims spp., Ditylenchus spp.

Control:

Curfew (1,3-D dichloropropene); fumigant; effective against ectoparasites like sting, ring, stunt, dagger, needle, sheath, pin, awl. Less efficacy on endoparasites: lance, root-knot, cyst, lesion, stubby-root, spiral.

Turfcare 376 (metam sodium)

Nemacur (fenamiphos)---no longer available

Nimitz ProG nematicide (Quali-Pro/Control Solutions Inc.): fluensulfone. Controls sting, lance, lesion, and root knot nematodes. Groom and aerify 10 days in advance of application. Soil temperature needs to be >55°F for efficacy. Rate: 20 lbs/acre per month for 3 months. APPLICATIONS EVERY 2-4 WEEKS AND TOTAL 240 LBS/ACRE/YEAR TO CONTROL LANCE NEMATODES.

Indemnify nematicide (Bayer): fluopyram. Acropetal penetrant. 2-6 months residual activity. Blocks cellular respiration and paralyzes the nematode. Effective on sting, spiral, ring, root knot, Anguina pacifica (stem gall) and other nematodes. DOES NOT AFFECT LANCE NEMATODES.

Majestene bionematicide (Marrone BioInnovations): heat-killed Burkholderia spp. strain A396 and spent fermentation media. Came out of the fruit and vegetable industry.

+MustGro™ Invest™ (deoiled seed meal from oriental mustard seed [Brassica juncea] high in glucosinolates, which break down to isothiocyanate [AITC], a nematicidal biofumigant; granular product applied at 15-20 lbs/1000 sq.ft.rate; has 5-1-1 nutrient formulation; apply only to a dry surface; aerate and irrigate immediately to move the product below the surface since the solubilization creates a gas; avoid puddling which can cause phytotoxicity on the turfgrass; releases a yellow-brown residue on putting green surfaces; effective on sting nematodes).

Sodium azide

BIONEMATICIDE; Nortica® (Bacillus firmus) Bayer biocontrol-preventative program: suppression (70 lbs/acre application rate; works best on sting nematodes; spring applications [February>March>April>May>June control in Florida]; primary function is to protect the roots; slow increase in turf density from improving root system; some control on lesion, lance, root rot, sheath, spiral and stunt nematodes.

Avid (abamectin) IR-4 special label in Georgia: 57 oz/acre; application on greens only. 14-21 day application intervals. Enhanced activity when combined with Daconil Action. Apply with penetrant wetting agent. Effective on root knot nematode. NOTE: REGISTRATION CANCELLED JUNE 30, 2016 FOR USE ON GREENS TO CONTROL NEMATODES.

New: Divanem (abamectin). Syngenta; controls sting, lance, root knot

Avensis (abamectin), PBI Gordon. Controls sting, lance, and root knot.

New: Todal (abamectin). QualiPro. Controls sting, root knot, lance

Nemamectin™ 0.7 SC (abamectin). Controls lance, sting, root knot

+Multiguard Protect® EC (Agriguard)—furfural (8 gal/acre rate requires 24 hr exposure for maximum efficacy effect; irrigate immediately after application; 2-4 week application schedule up to 6 applications/yr). EFFECTIVE AGAINST ECTOPARASITES. APPLY WITH WET SOIL AND IRRIGATE IMMEDIATELY AFTER APPLICATION.

AzaGuard (azadirachtin)

Zelto bionematicide: heat-killed Burkholderia. Controls root knot, ring, stubby, lance, and sting. {Target Specialty}

BIOSAFE SYSTEMS NEMATODE PROGRAM

ZeroTol 2.0 (hydrogen dioxide) + AzaGuard: 3 applications 7-21 days apart.

7 day cycle: 0.5 oz/M AzaGuard + 6.5-12 oz/M ZeroTol. Resulted in zero sting & lance.

21 day cycle: 2 gal/A ZeroTol + 19 oz/A AzaGuard. Resulted in 88% reduction of nematodes and no sting nematodes remaining in tested samples.

+ Reference: W.T. Crow. The art of war...against nematodes. Florida Turfgrass Association. www.ftga.org. Florida Turf Digest: January/February 2012. Pages 13-18.

Nematode Threshold Levels for Seashore Paspalum

***Root-knot = 80-300 Meloidogyne. Moderate to high risk**

***Sting = 10-25 Belonolaimus (ecto-parasite: live outside and damage lateral roots; salinity threshold <9600 ppm TDS salinity)**

***Lance = 40-120 Hoplolaimus (migratory endo-parasites that enter roots & tunnel through cell walls; high population potential <6400 ppm TDS salinity)**

***Stubby-root = 150-300 Paratrichodorus; 40-120 Trichodorus**

***Ring = 500-1000 Mesocriconema**

***Sheath = 150-300 Hemicycliophora**

***Sheathoid = 500-1000 Hemicriconemoides**

***Awl = 10-25 Dolichodorus**

Spiral = 300-700 Helicotylenchus; 150-300 Peltamigratus**Preference on paspalum**

***Stunt = <1000 Tylenchorhynchus**

***Cyst = 10-40 Heterodera (not thought to cause significant damage)**

***Lesion = <150 Pratylenchus**

***Ring = 500-1000 Mesocriconema**