

Importance of nematodes on turfgrasses and landscape plants

Fred Warner, Michigan State University



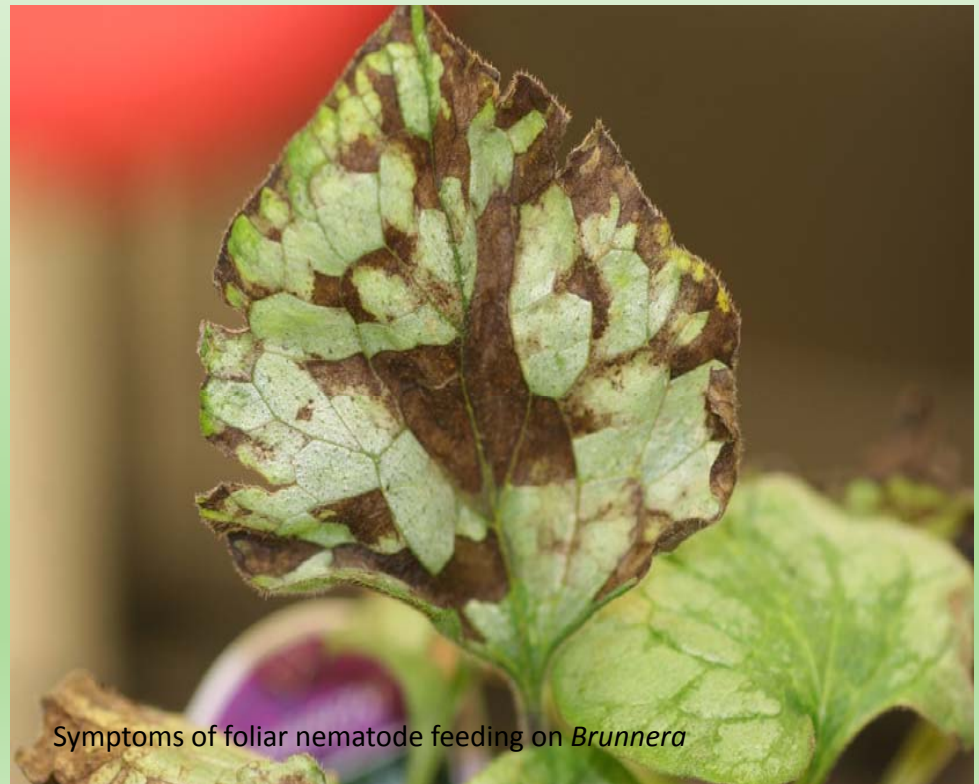
Nematodes

Nematodes are non-segmented roundworms in the Phylum Nematoda (Nemata). They are the most numerous animals on Earth.



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Inconvenient truth 1: The impacts of plant-parasitic nematodes on turfgrasses and landscape plants are not well documented especially economic losses.



Inconvenient truth 2: Turf managers in many temperate climates ignore plant-parasitic nematodes.

The evidence: Michigan is home to 900-1000 golf courses yet the record number of nematode samples we have received in a year is 65 although our lab fees are nominal (\$25.00/analysis for a nematode sample). Roughly half of those samples were from out-of-state



16th hole, Hawk Hollow Golf Course, Bath, MI

Critical Question: Are plant-parasitic nematode problems on the rise in turf?



*Got Nematodes?
Don't use harsh chemical
pesticides that close down
your course*

humagroturf.com

A Look Back to 1993

	Frequency of Detection	
nematode	2013	1993
ring	90.4	69.7
stunt	88.5	76.1
spiral	61.5	61.5
root-knot	17.3	16.5
turf cyst	9.6	10.1
grass cyst	7.7	0.0
lance	7.7	22.0
needle	5.8	3.7
stubby-root	3.8	0.9
lesion	1.9	49.5
pin	0.0	17.4
sheath	0.0	6.4
dagger	0.0	4.6

A Look Back to 1993

Nematode Risk Rating	Risk Ratings Assigned (% of samples)	
	2013	1993
0 = none	0.0	2.7
1 = low	5.8	21.2
2 = low-moderate	7.6	32.1
3 = moderate-high	13.5	36.7
4 = high	42.3	5.5
5 = severe	30.8	1.8

Why might nematode levels be on the rise on golf greens?

More golf courses are trying to meet USGA specifications. Movement away from native soils to very coarse textured soils should favor nematodes.

If the predominant grass species on greens and tees is annual bluegrass, this species is preferred by many/most species of plant-parasitic nematodes over creeping bentgrass according to Nathaniel Mitkowski.

Greens are getting older and older greens typically have higher nematode population densities (strong correlation in New England).

Movement away from carbamate and organophosphate insecticides, used to control cutworms and other insect pests in the past, has allowed nematode population densities to increase.

Climate change. As winters get warmer, overwintering mortality of nematodes and other cold-blooded animals is reduced or new species become established.

Other causes?

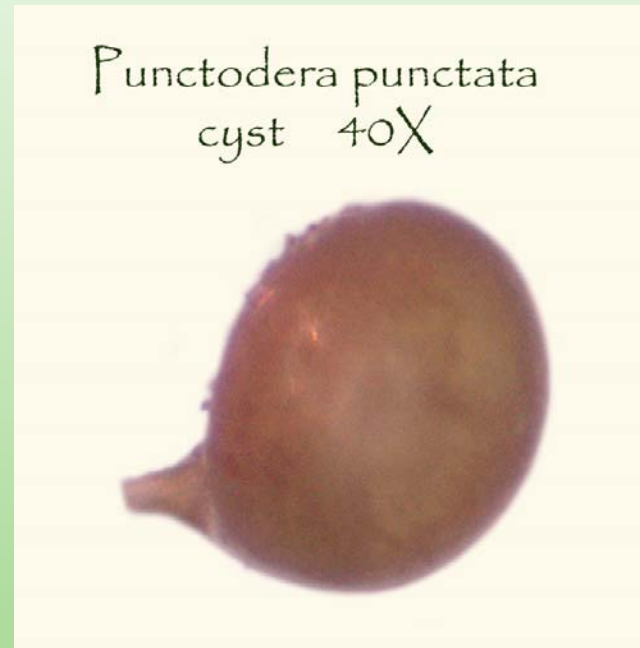
Recent Observations, 2013-15

Symptoms due to nematode feeding observed on new greens (<3 years old).

Detection of the grass cyst nematode on golf greens in MI. Bluegrass is the preferred grass host for this species whereas; bentgrass is preferred for the turf cyst nematode.

Severe nematode problems observed in fairways.

Very high population densities of needle nematodes recovered from finer textured soils (native soils – fairways).

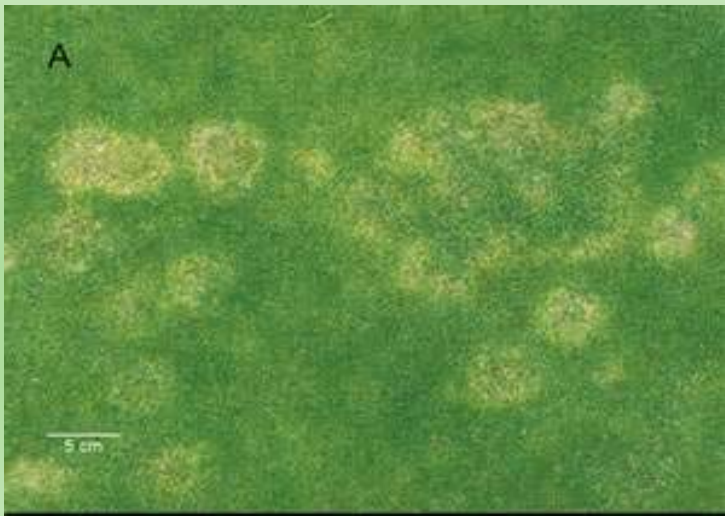


Needle nematode damage to a fairway in SE MI, 2013



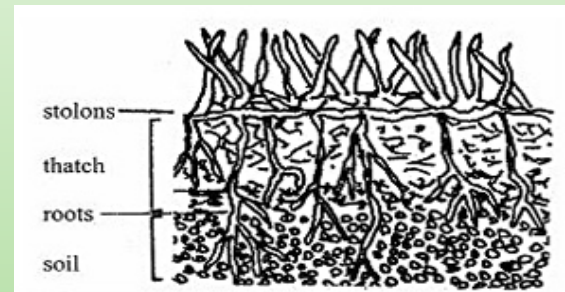
stem gall nematodes, *Anguina pacifica* and *Subanguina radicicola*

Most likely areas to find *A. pacifica* are golf course greens and tees from central CA to WA along the Pacific Ocean.



Cultural Control Tactics

Steps should be taken to improve or maintain the health of roots. Since nematodes reduce root volumes and weights, infected turfgrasses will not grow well unless nematode numbers decrease or good root health is restored.



Green infested with lesion, needle and ring nematodes in New Mexico
(note the health of the fringe/collar)



Photo by Steve Thomas, New Mexico State Univ.

Chemical Control Tactics

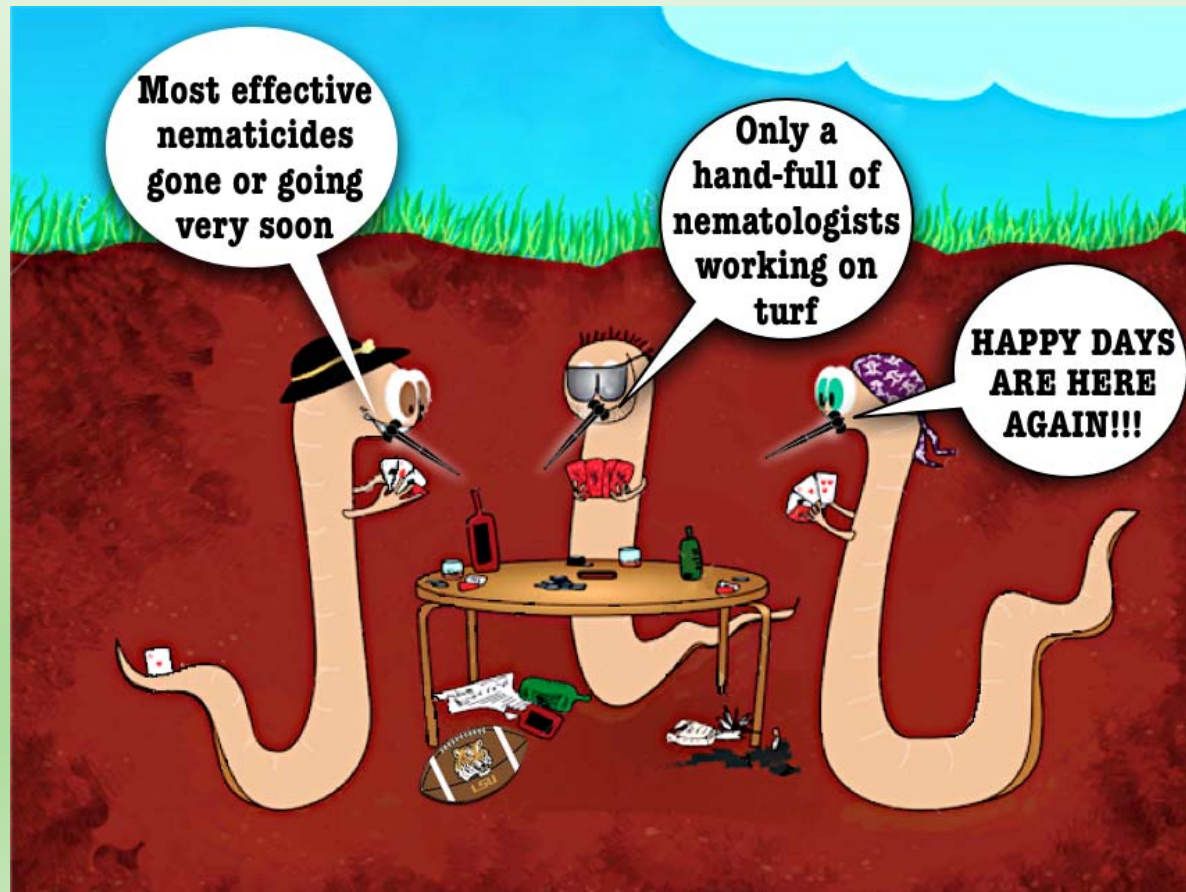


Reverse Thinking Cap Working w/ Turfgrass Managers

While crop producers usually try to optimize plant growth and yields and increase SOM; turf managers, especially golf course superintendents, often want to slow growth and minimize SOM.



Inconvenient truth 3: Plant-parasitic nematodes do not want administrators/decision-makers to hire more Nematologists.
(I really don't know if this is true, I just suspect it is.)



Inconvenient truth 4: Nurserymen/landscapers/greenhouse operators tend to ignore plant-parasitic nematodes until they need phytosanitary certificates in order to export.

I believe this is very unfortunate since they propagate and disseminate hundreds of plant species.



Foliar nematodes symptoms on *Anemone*

Walters Gardens Nursery, located in Zeeland, MI

North America's leading wholesale grower of perennials since 1946. They currently have 1500 acres and 500,000 sq. feet of greenhouse space.

>125 genera
ca. 1,900 cultivars/varieties

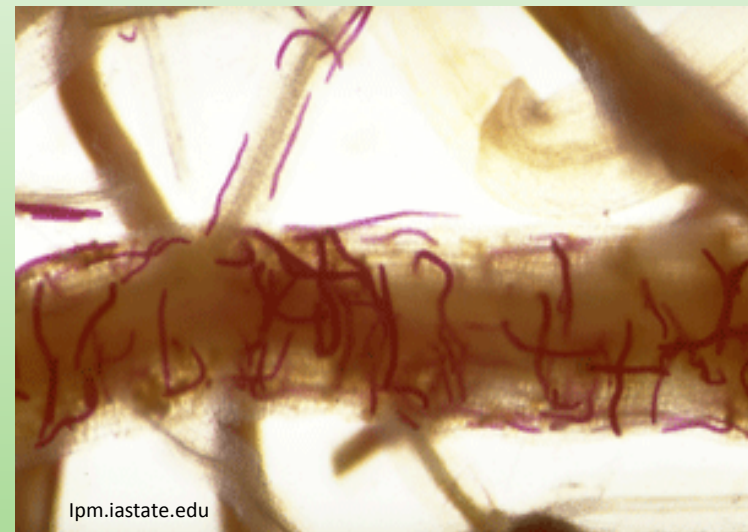


Walters Gardens Nursery, located in Zeeland, MI Yield Loss Estimates of Daylilies due to Root-Knot Nematodes on 0.88 of an acre, 2011.

Variety	# Plants	% Culled	Value Culled (\$)
Pardon Me	15,435	70	71,012.57
Hush Little Baby	1,200	100	6,750.00
Joan Senior	10,155	84	39,827.50
Big Snowbird	1,390	50	4,190.85
TOTAL LOSS			121,780.92

Some generalizations regarding nematodes and landscape plants

- 1) Mature trees will tolerate nematode feeding without the production of significant secondary symptoms.
- 2) Woody plants are not susceptible to foliar nematodes.
- 3) Nursery stock is one of the principle ways nematodes are disseminated.
- 4) Most homeowners/customers have little or no knowledge of plant-parasitic nematodes.



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Pecan root-knot nematode on laurel oak



Photographs by Lorraine Graney, Bartlett Tree Research Laboratories

Genera of parasitic nematodes recovered from landscape plants in Michigan

Root Pathogens

Criconemella (and synonyms)

Dolichodorus

Gracilicus

Helicotylenchus

Hemicycliophora

Heterodera

Hoplolaimus

Longidorus

Meloidogyne

Paratrichodorus

Paratylenchus

Pratylenchus

Radopholus

Rotylenchus

Trichodorus

Tylenchorrhynchus

Trichodorus

Xiphinema

Foliar Pathogens

Aphelenchoides

Bursaphelenchus

Ditylenchus



15 Top Regulated Nematodes

- 2 *Globodera sp.*
- 2 *Heterodera sp.*
- 2 *Aphelenchoides sp.*
- 2 *Bursaphelenchus sp.*
- 2 *Ditylenchus sp.*
- 2 *Xiphinema sp.*
- *Radopholus similis*
- *Nacobbus aberrans*
- *Anguina tritici*

Invasion of a sun worshiper.

The burrowing nematode, *Radopholus similis*, in MI



How did *R. similis* get there?

A banana plant is moved to a bed every year from a greenhouse so the public can see one.

It has spread to *Miscanthus* which grows adjacent to the banana and apparently survives the winter on the grass host.

Steam tunnels keep soil in some parts of the garden warm enough for *R. similis*.



Major Emerging Problems with minor *Meloidogyne* species

Dr. Axel Elling, WSU, Phytopath 103: 1092-1102 (2013)

Out of 170 orders placed with international vendors on the internet in 2012, 89% did not comply with phytosanitary import requirements in a study conducted by the national plant quarantine institute in Germany (EPPO Bull. 42: 171-175).

While some vendors did not deliver plants and cited import restrictions, 39% of plant shipments were intentionally mislabeled as toys, books or other innocuous items – presumably to avoid detection by customs during import.

In a recent study aimed at analyzing institutional and demographic trends in plant pathology in the U.S., plant nematology was identified as only two subdisciplines that have undergone massive declines (Plant Dis. 93: 1228-1237). Since peak membership in 1987, the number of members in the Society of Nematologists has declined 50%.

Acknowledgments

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Society of Nematologists

Lorraine Graney, Bartlett

various golf course superintendents



Please help us diagnose this problem on dahlia.

Thanks,
Fred W. and
Jan Byrne