Nematode damage on turf: an increasing threat and how to manage it

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PACE TURF

Avoiding nematode damage

- Cultural practices
- Conventional pesticides
- Biological products

Why the increase in nematode damage?

- Loss of Nemacur
- Decreased use of thiophanate methyl
- Demand for drier greens surfaces – any root damage will result in increased stress
- Demand for faster greens – weak plants are failing

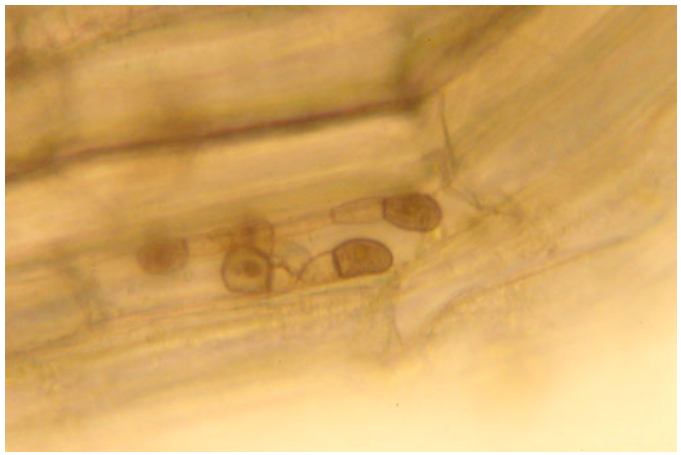
Cultural practices

Avoid turf stress

- Disease
  - Summer patch
  - Take all patch
  - Other root diseases

Manganese and disease prevention

- Root infecting diseases (spring dead spot, take-all patch, decline) suppressed by Mn
- >30 ppm soil Mn (Mehlich III)
- >90 ppm iron
- Granusol Mn (31%) or manganese sulfate at 100 – 200 lbs/A, quarterly



Cultural practices

Avoid turf stress

- Shade

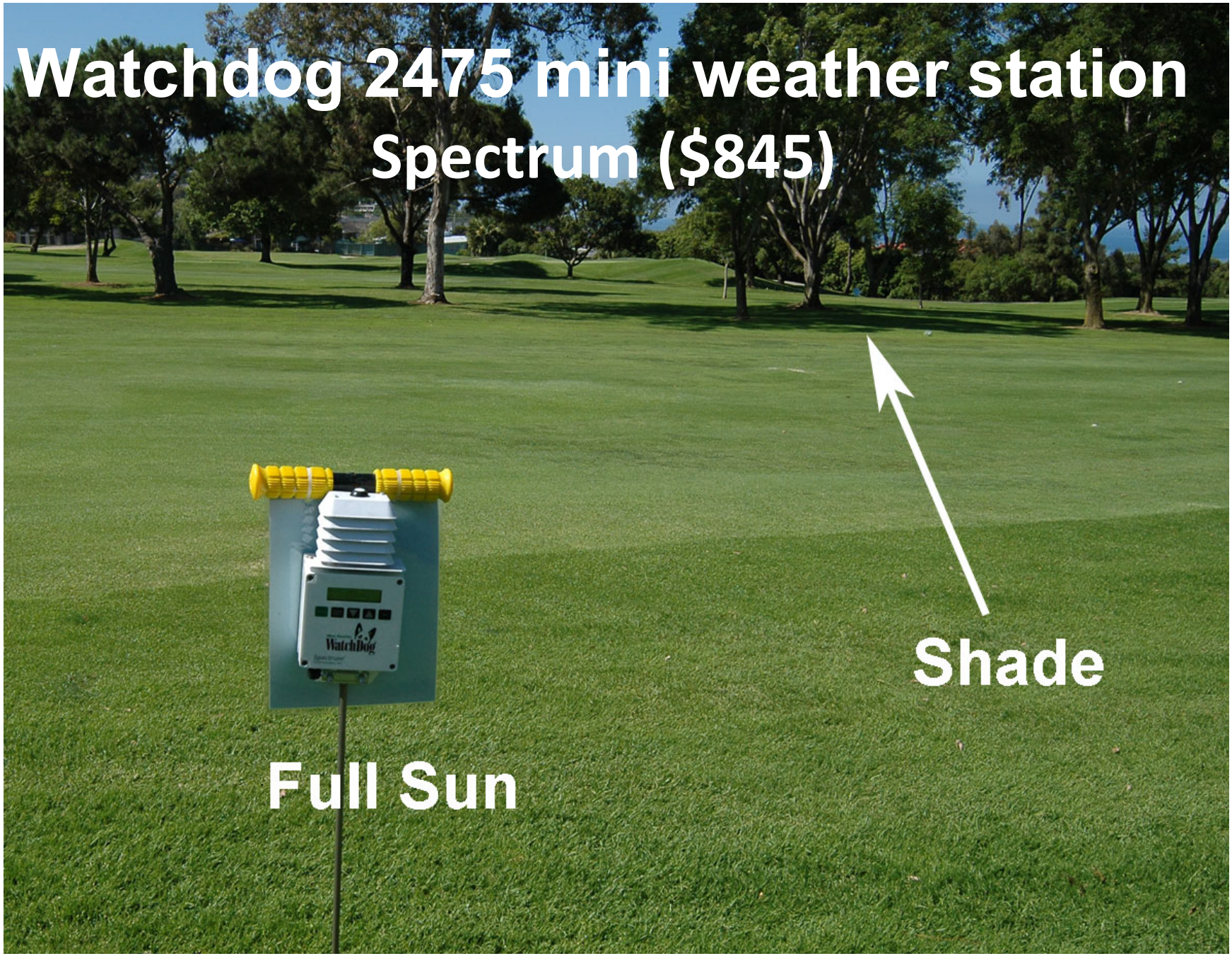
Solar radiation guidelines

Turf type	Watts/ day (Toro)	Langley/ day (Rainbird)	DLI mol/day
Cool Season	116–223	240–480	21–41
Warm Season	390–465	812–969	70–83

Characterize with photography


14
15
17
10/4/86


14
15
17
10/6/98


Watchdog 2475 mini weather station
Spectrum ($845)
Shade
Full Sun

Cultural practices

Avoid turf stress

- Proper nutrition
- Proper soil moisture

Soil moisture management

Dry soils promote:

- Turf stress
- Gray leaf spot
- Brown ring patch
- Anthracnose

Monitor greens soil moisture with a TDR 300 meter

Monitor greens soil moisture with a TDR 300 meter

- About $1,000
- Available from Spectrum Technologies
- Target 18-25% soil moisture for optimum turf health (sand based greens)
- Optimum range will vary depending on soil type

Conventional pesticides

- Thiophanate-methyl (Easout, Senator, ProTurf)
- Methyl iodide (Midas) fumigant (pre-plant)

Canadian Nematologists

- Dr. Qing Yu, AAFC in Ottawa
- Dr. Tom Forge, AAFC, Agassi, BC
- Dr. Fengcheng Sun, Canada Food and Inspection Agency, Ottawa

Biological products
Phosphites?

- Phosphites have shown good activity against Pythium, anthracnose and algae
- Preliminary data from Israel shows good activity against cyst and root knot nematodes also

e-Xtra*

Phosphite Inhibits Development of the Nematodes *Heterodera avenae* and *Meloidogyne marylandi* in Cereals

Yuji Oka, Nadia Tkachi, and Mishael Mor

First and second authors: Nematology Unit, Agricultural Research Organization (ARO), Gilat Research Center, M. P. Negev 85280, Israel; and third author: Department of Entomology and Nematology, ARO, the Volcani Center, Bet Dagan 50250, Israel.

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ABSTRACT

Oka, Y., Tkachi, N., and Mor, M. 2007. Phosphite inhibits development of the nematodes *Heterodera avenae* and *Meloidogyne marylandi* in cereals. Phytopathology 97:396-404.

Phosphonic acid (H_3PO_3) solutions were applied to wheat or to bristle oat as soil drenches before inoculation with juveniles of the sedentary, endoparasitic nematodes *Heterodera avenae* or *Meloidogyne marylandi*. All the solutions, which were pH adjusted and added at levels as low as 0.63 mg of phosphite (HPO_3^{2-}) per plant, reduced the numbers of *H. avenae* females and *M. marylandi* egg masses. Phosphate (PO_4^{3-}), applied as potassium phosphate at the same concentrations, did not reduce the number of female nematodes on the wheat. Addition of phosphate to the phosphite solutions did not change the inhibitory effect of phosphite on *H. avenae*, but it reduced phosphite's effect on *M. marylandi*. Phosphite also reduced the number of *H. avenae* females when applied as many as 20 days after addition of nematodes. The phosphite treatment did not prevent *M. marylandi* juveniles from penetrating wheat roots or inducing giant cells. However, phosphite inhibited giant cell development: 14 days after inoculation, the giant cells in the phosphite-treated wheat were almost completely vacuolated, whereas those in untreated wheat contained dense cytoplasm.

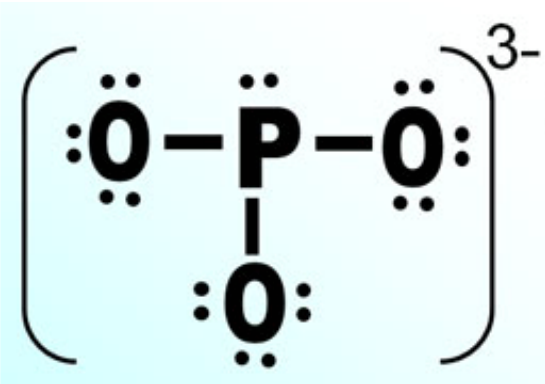
Several nontoxic compounds are known to inhibit pathogen infection or development in plants (19). When plant responses are involved, this phenomenon is often called induced resistance. Induced resistance to plant pathogens may involve several mecha- nematode are called giant cells. Syncytia develop from the joining of several neighboring cells via cell-wall dissolution plus hypertrophy, whereas giant cells develop from individual cells via hypertrophy and mitosis without cytokinesis (17). The nematodes

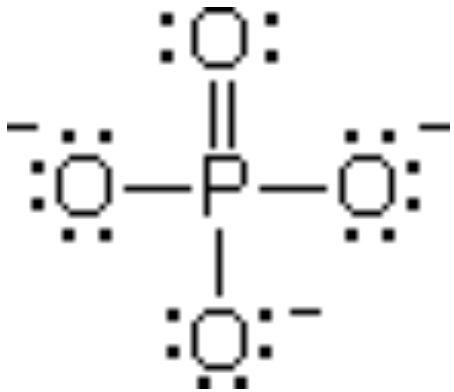
Biological products Phosphites?

- When nematodes feed on roots of treated turf, they could not penetrate the roots to feed, and could not mature and reproduce
- Phosphates were not effective
- Further work needs to be done

Phosphites

- Sold as phosphorus fertilizer, but not metabolized by plant
- Also known phosphonates, phosphorus acid, fosetyl-Al and salts of phosphorus acid
- Based on the phosphite ion PO_3^{-3}
- Know the difference vs. phosphates, which do NOT have disease activity PO_4^{-3}





Biological products
Phosphites

Product name	Active Ingredient
Aliette, Prodigy	fosetyl-Al
Alude, Elemax, Fosphite, Magellan	Salts of phosphorus acid
PK Plus, ReSyst, Vital	Potassium phosphite

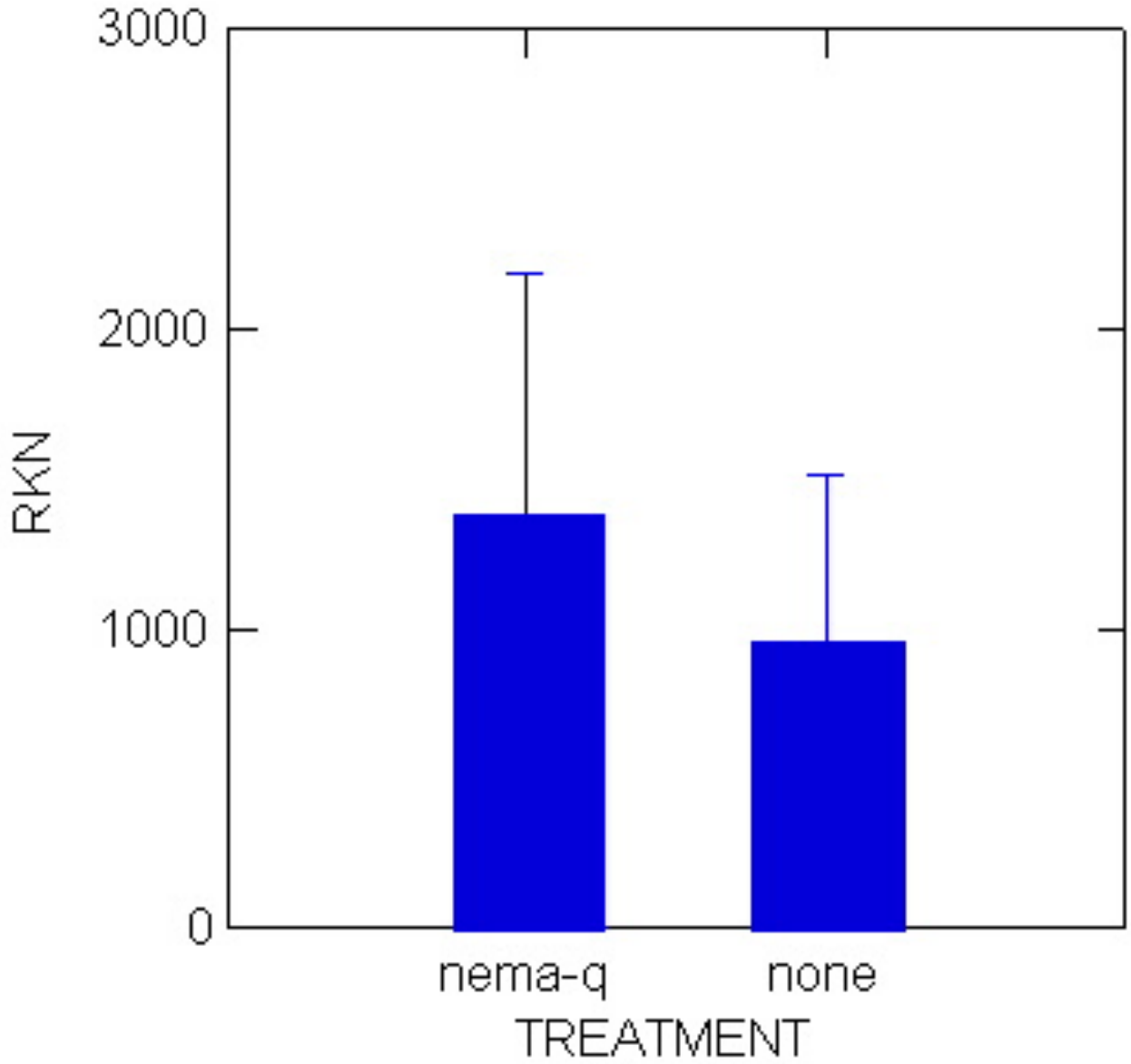
Biological products
Azadirachtin-based products

- Good activity on the stem gall nematode, *Anguina pacificae*
- Potential for activity against other nematodes
- Products include Agroneem Plus, Neemix, Trilogy
- Class 11 (Ontario)

Biological products
Saponin-based products

- Nema-Q
- Saponins extracted from *Quillaja saponaria* tree
- Labeled in the U.S.
- Limited data on turf nematodes

Root knot/100 CC Nema-Q program



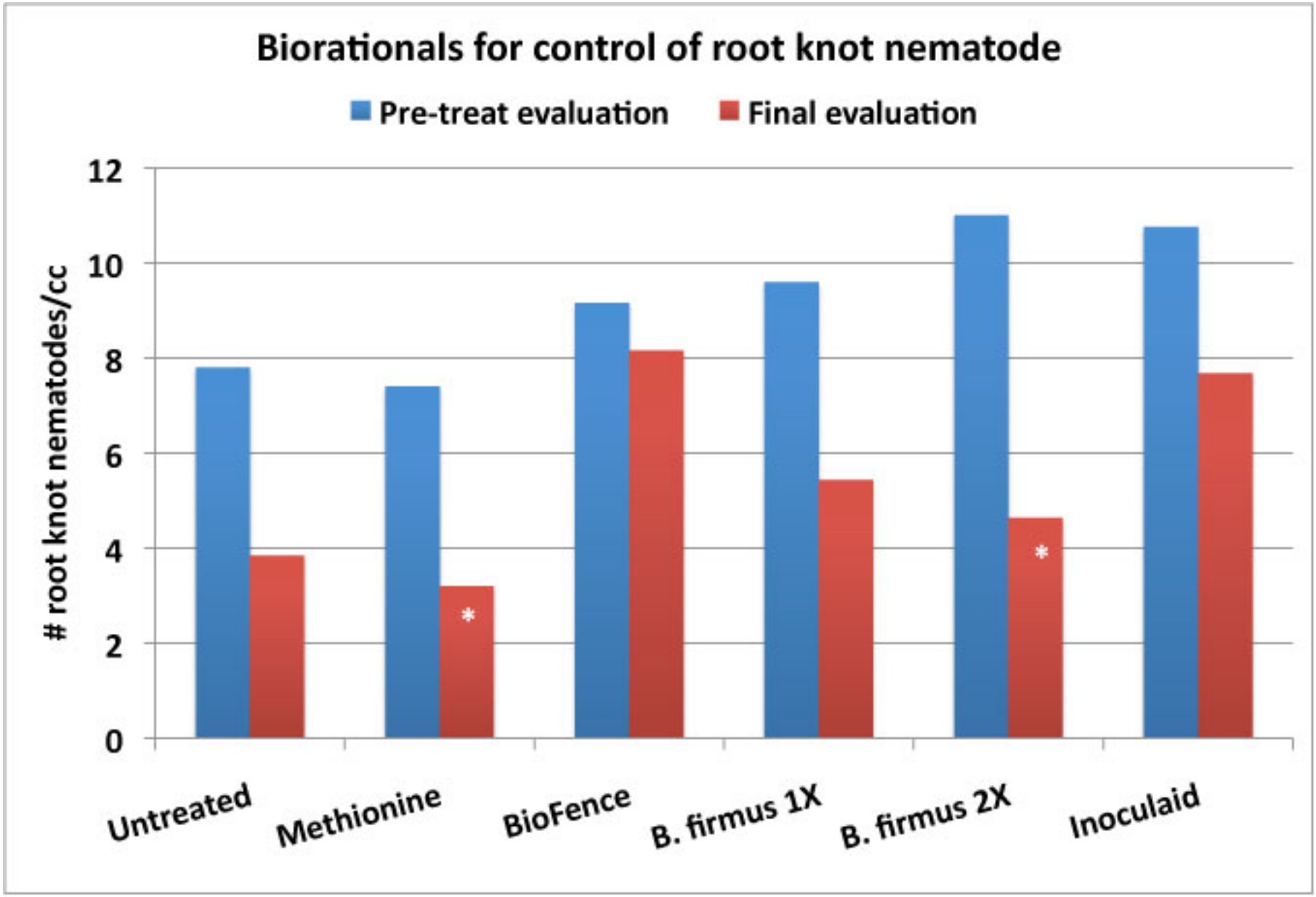
Microbial-based products

- EcoNem *(Pasteuria usgae)*:
  - Labeled in the U.S. for sting nematode
  - Bacteria multiply inside nematode, leading to death
  - Pasteuria Biosciences
  - Field results are highly variable

Microbial-based products

- Nortica *(Bacillus firmus)*:
  - Labeled in the U.S. broad variety of nematodes (cyst, lance, lesion, root-knot, sheath, spiral, sting, stunt)
  - Bacteria multiply around root zone and protect roots from nematode feeding
  - Bayer
  - Results variable

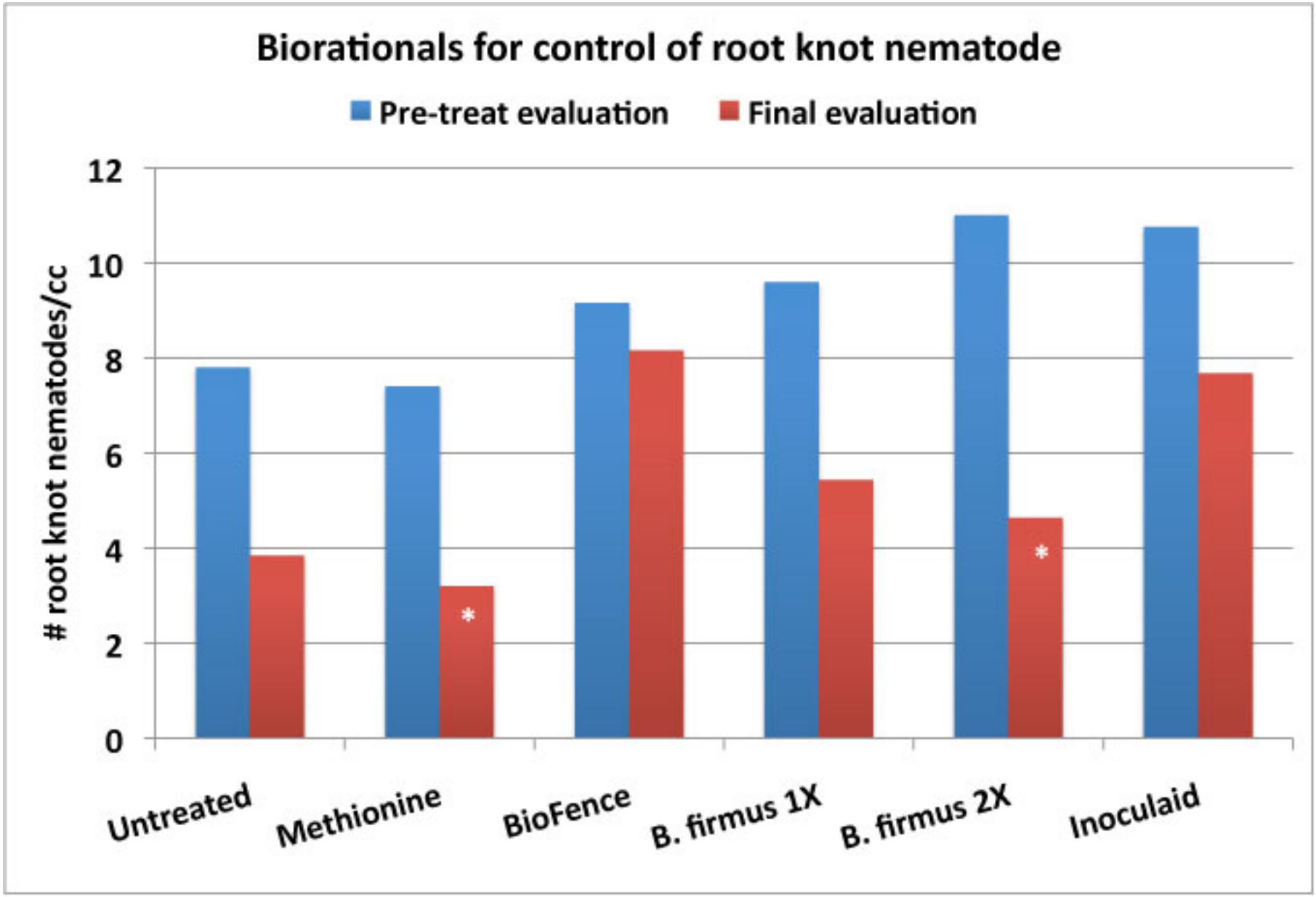
Research results, 2009: The Farms



Biological products
Mustard plant-based products

- Isothiocyanates act as fumigant
- Products include Biofence, MOSS
- Class 11 pesticide (Ontario)
- Limited efficacy data available

Research results, 2009: The Farms



Biological products
Methionine

- Amino acid
- Good activity against sting, ring nematodes
- Phytoxicity to turf a potential issue
- Not available as an agricultural product
- More work needs to be done

Ask for the data!

- Replicated
- Non-treated controls
- Multiple locations
- 80% control, 80% of the time
- No cherry picking

Do your own research

- Remember to include non-treated controls

Do your own research

Reference

AUGUST, 2010

Testing products and practices:
a guide for golf course superintendent

Part 1: Getting started

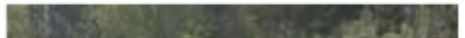
Today, the simple act of selecting the best products and practices f golf course can be daunting. New pesticides, growth regulators amendments and equipment are introduced each year. Thes the already wide selection of products available for use on c you layer onto this the unique combination of soils, turf characterize each golf course, it is difficult to predi and practices will perform. Making responsible and ef area is an important part of the turf manager's job, b rows more complex with every new product that is m practice that is developed.

To determine which products ar ices work best on your own golf course, consider s ogram to supplement the more general efficacy da rs and suppliers should have available from indepe universities or private consulting groups. The basic own testing program are simple, and the rewards are ed confidence in your selection of products and pr an also indicate where changes are necessary to impro ability conditions. Conducting your own tests will also allow y ore out of technical articles on turf management. Another importan efit is that testing provides you with concrete backup to support the decisions and management changes you make. Finally, sharing your results with other turf managers at meetings, on line Forums, or on PACE Turf's Super Journal helps make the whole industry better.

You've got to have an attitude

Before you set up a testing program, perform an attitude check. If you are running a test just to prove that a product will work (or that it will fail), then

nts:



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