Root Lesion Nematodes
Pests of Corn, Soybean, & Every Other Crop Grown in Wisconsin

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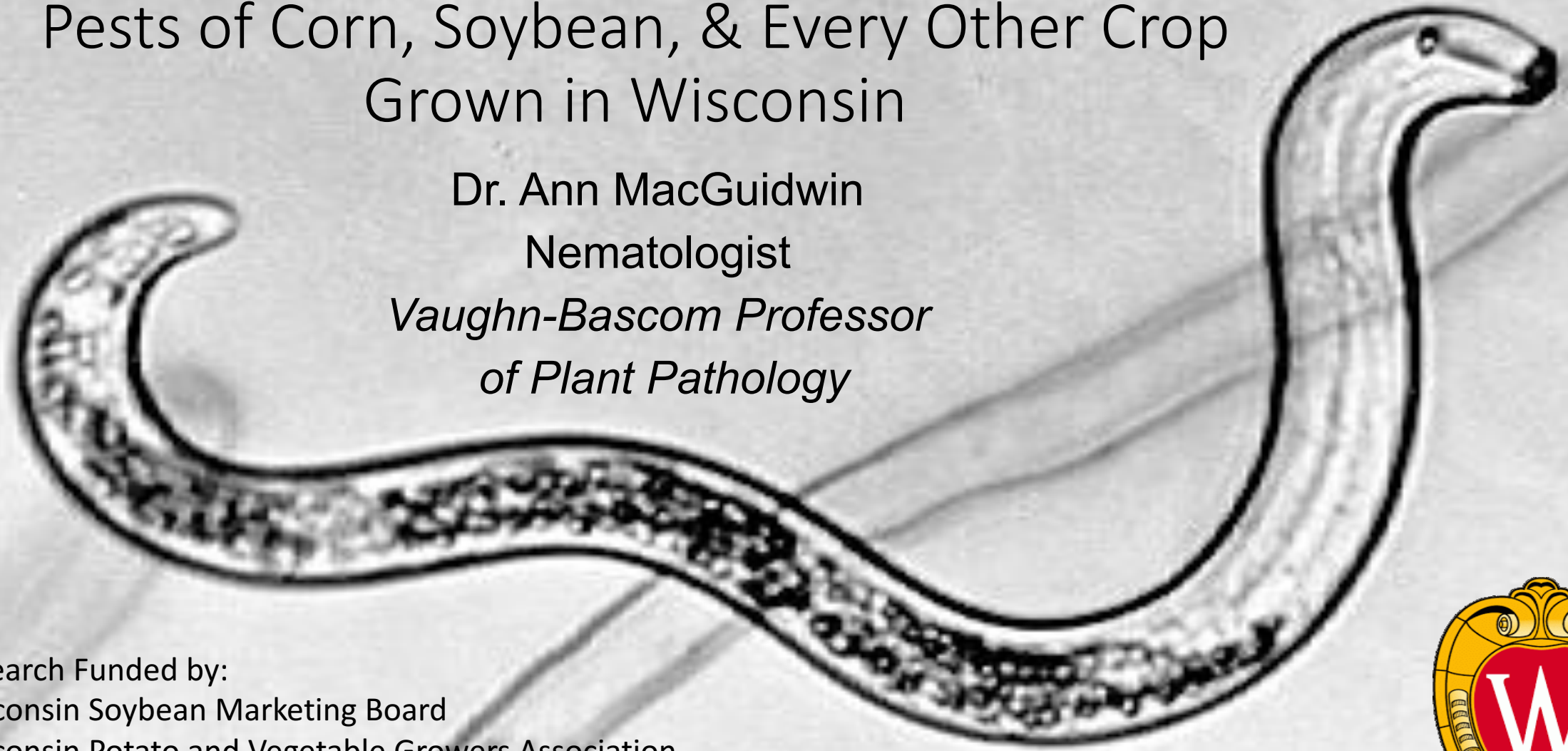


Research Funded by:
Wisconsin Soybean Marketing Board
Wisconsin Potato and Vegetable Growers Association
Wisconsin Corn Board
Gifts from Syngenta Seed Care and Bayer

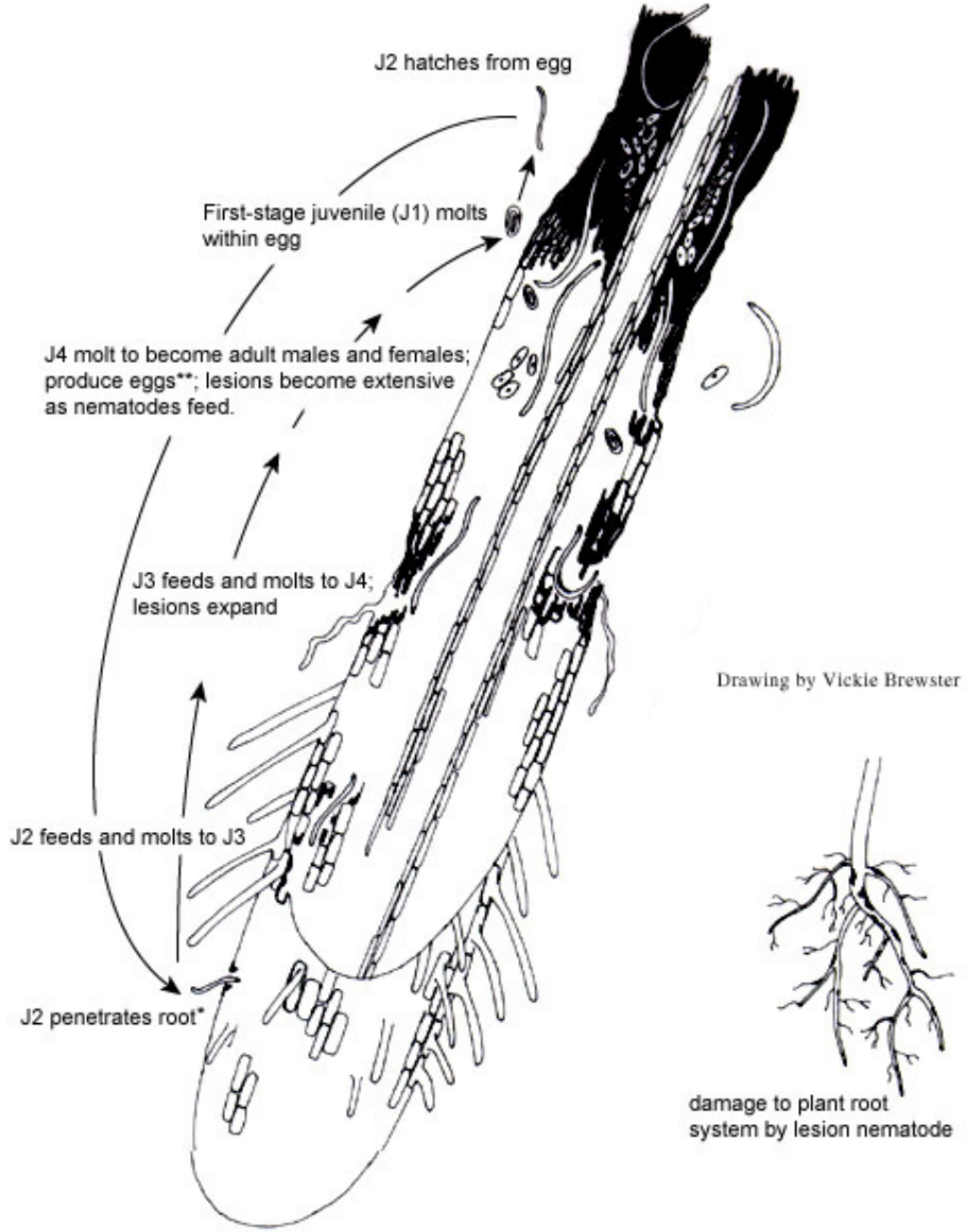
- 70 species worldwide
- At least 8 species in Wisconsin

Corn roots infected with Root Lesion Nematode

35 days

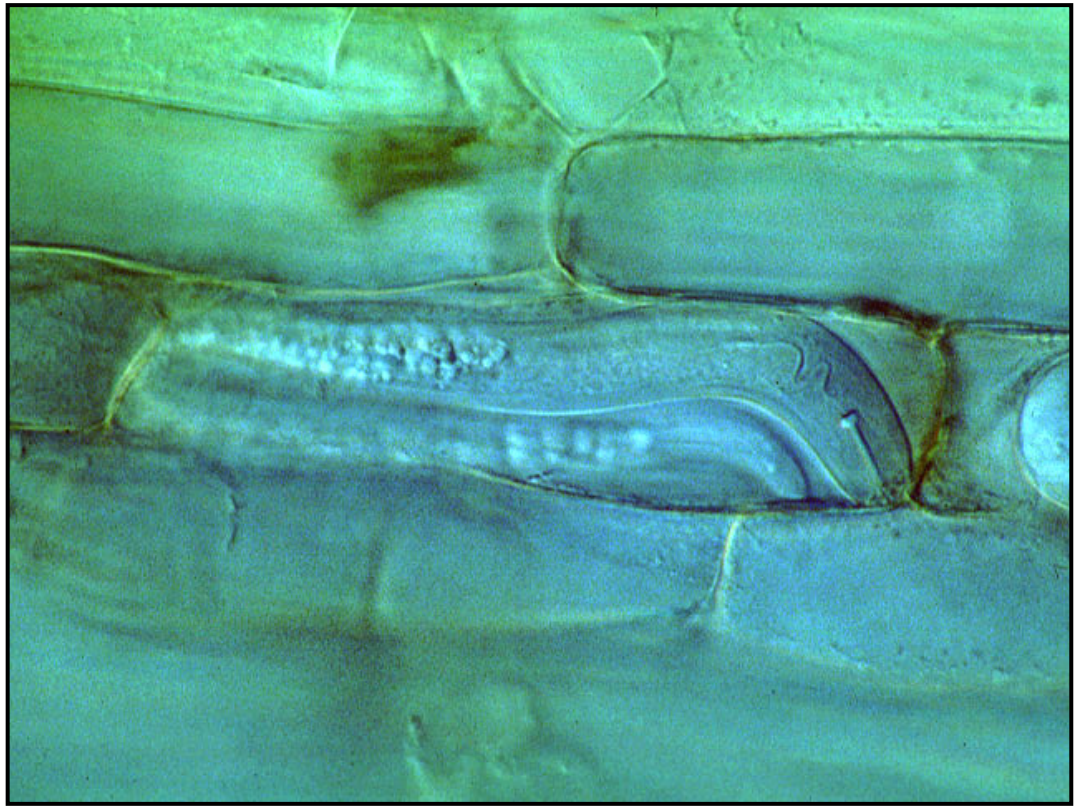
egg
J2
J3
J4
adult

live in soil or root

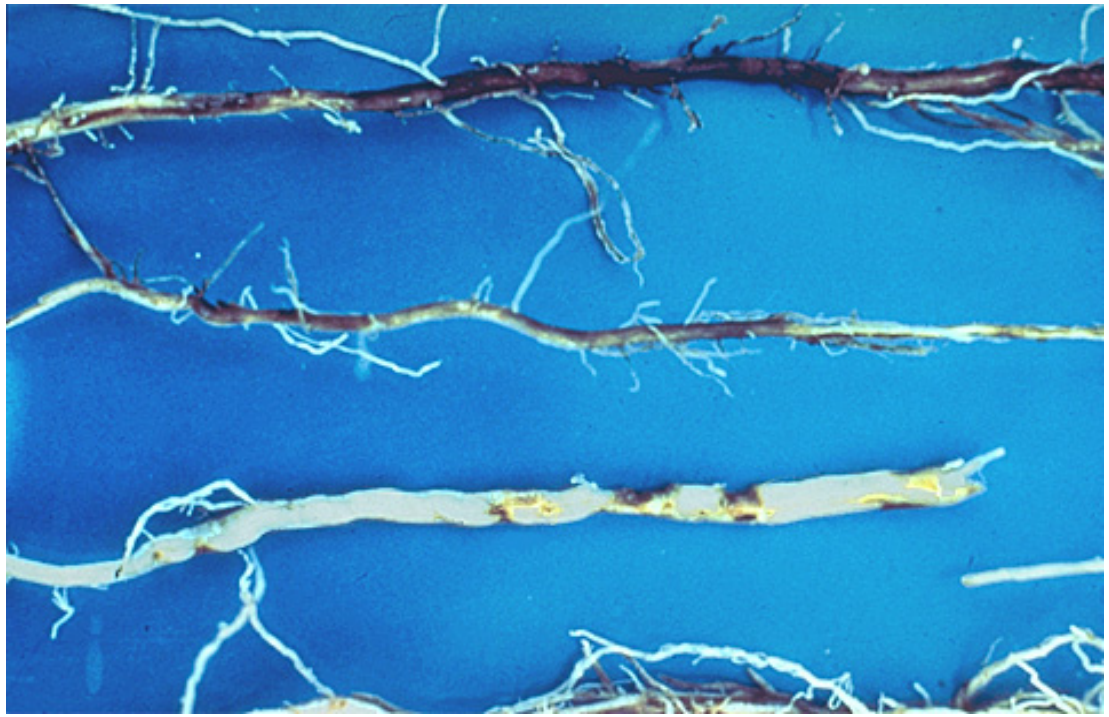


*any life stage, second-stage juvenile (J2) to adult, can emerge and re-infect root at any point
**eggs can be laid in soil or root -- entire life cycle may occur in root

Live in soil and feed from the outside



Live and feed inside roots



Symptoms caused by Lesion Nematodes

	Percent Incidence			
Nematode Pest	**2013**	**2014**	**2015**	**2016**
Root lesion	94	95	90	93
Spiral	74	71	74	72
Dagger	40	37	35	32
Lance	3	6	6	8
Stunt	18	22	24	14
Stubby root	3	4	7	7
Pin	13	16	61	7
Ring	4	4	4	5
Needle	1	1	9	3
Root knot	0.3	3	0	1
Soybean cyst	23	25	20	30

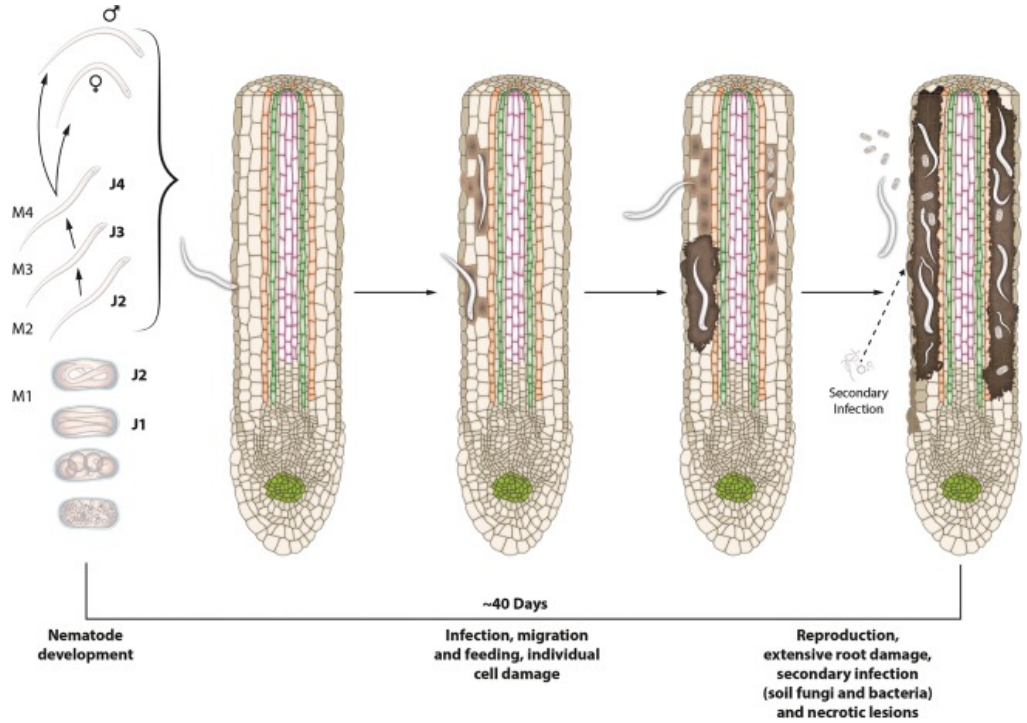
Year	Number of samples submitted March 10 to June 15	Mean Population density per 100 cm^3 soil
1999	136	23
2000	10	180
2001	7	53
2002	18	97
2003	11	141
2004	4	28
2007	99	180
2010	59	67
2011	6	64
Total	350	88

Average number of Root Lesion Nematodes increased from 1999 to 2012 by ca 8 nematodes per year

Genus	**Estimate**	**R^2**	***P***
Root Lesion	7.8	6.2	0.00
Stunt	1.0	0.8	0.02
Pin	0.7	1.0	0.01
Lance	-0.7	1.5	0.00

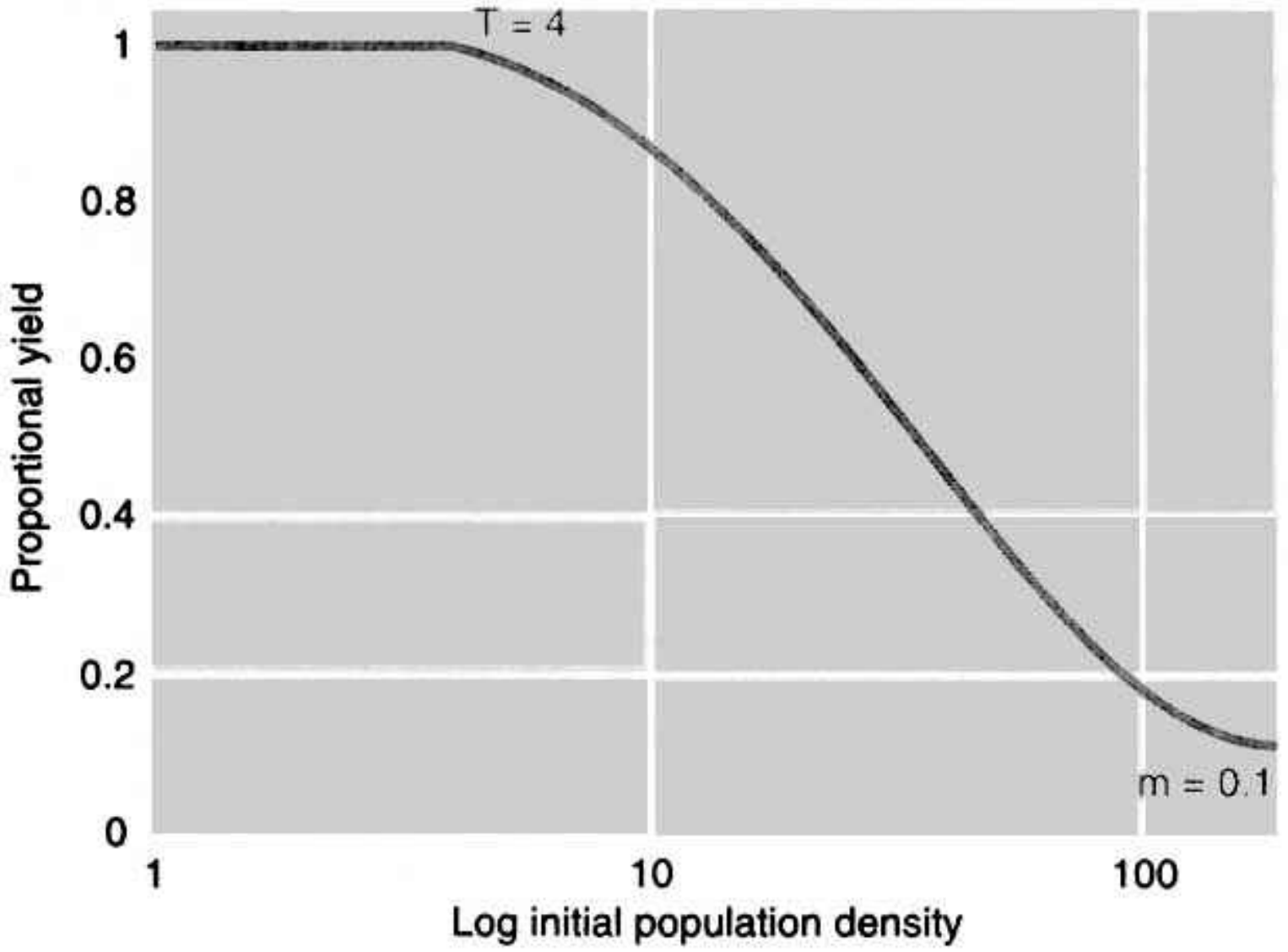
Host Range

- 400 species of plants
- All crops grown in Wisconsin
- Some differences in preference among species



Specificity for attraction, internal feeding, reproduction, symptoms, & damage

Crop damage inflicted by Root Lesion Nematodes



Note:

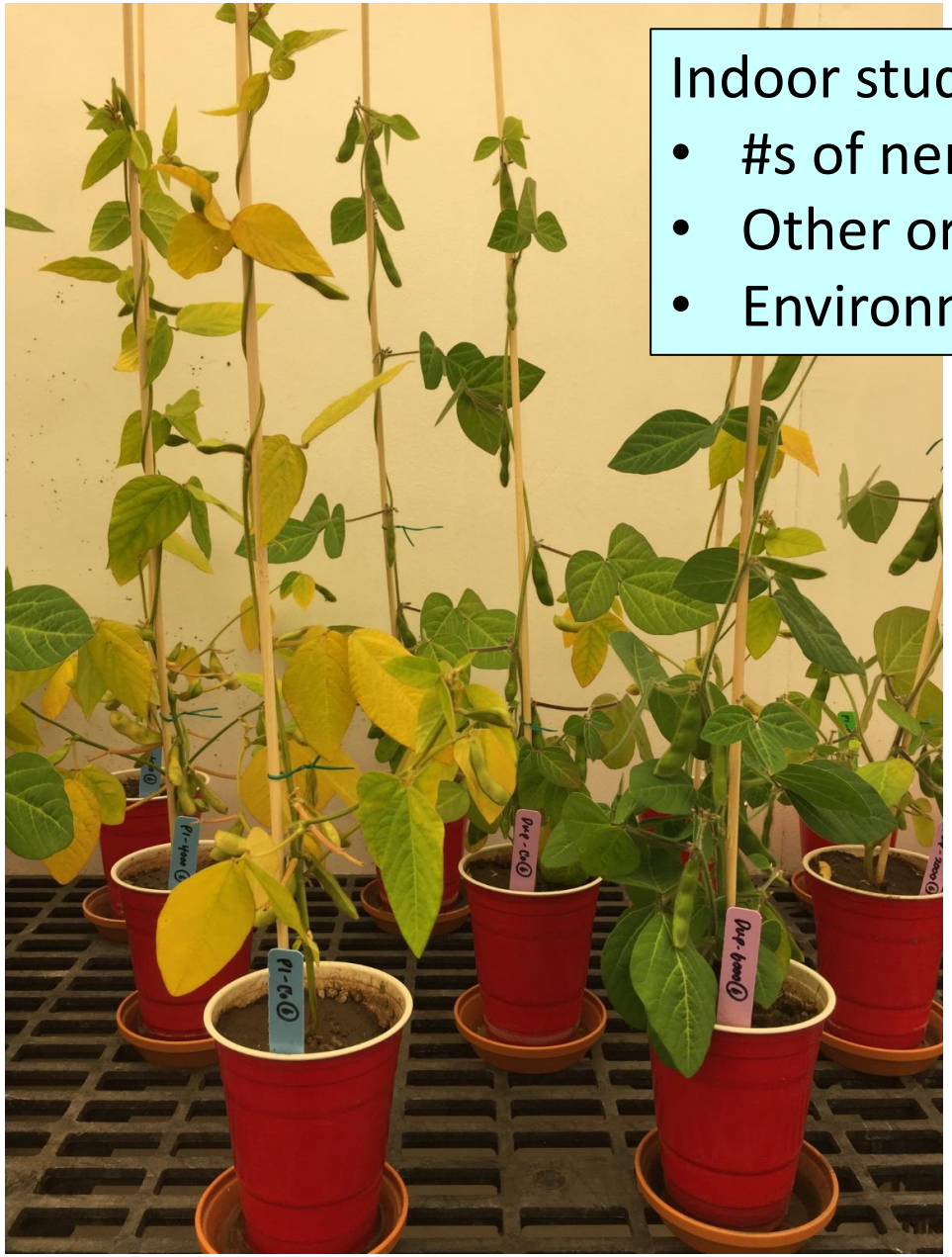
Crops can tolerate a low parasite load of Root Lesion nematodes

The critical time for sustaining yield under the stress of nematode parasitism is early in the season

Root Lesion is an obligate parasite that rarely (if ever) kills plants

Relating Population Densities of Root Lesion Nematode to Crop Damage

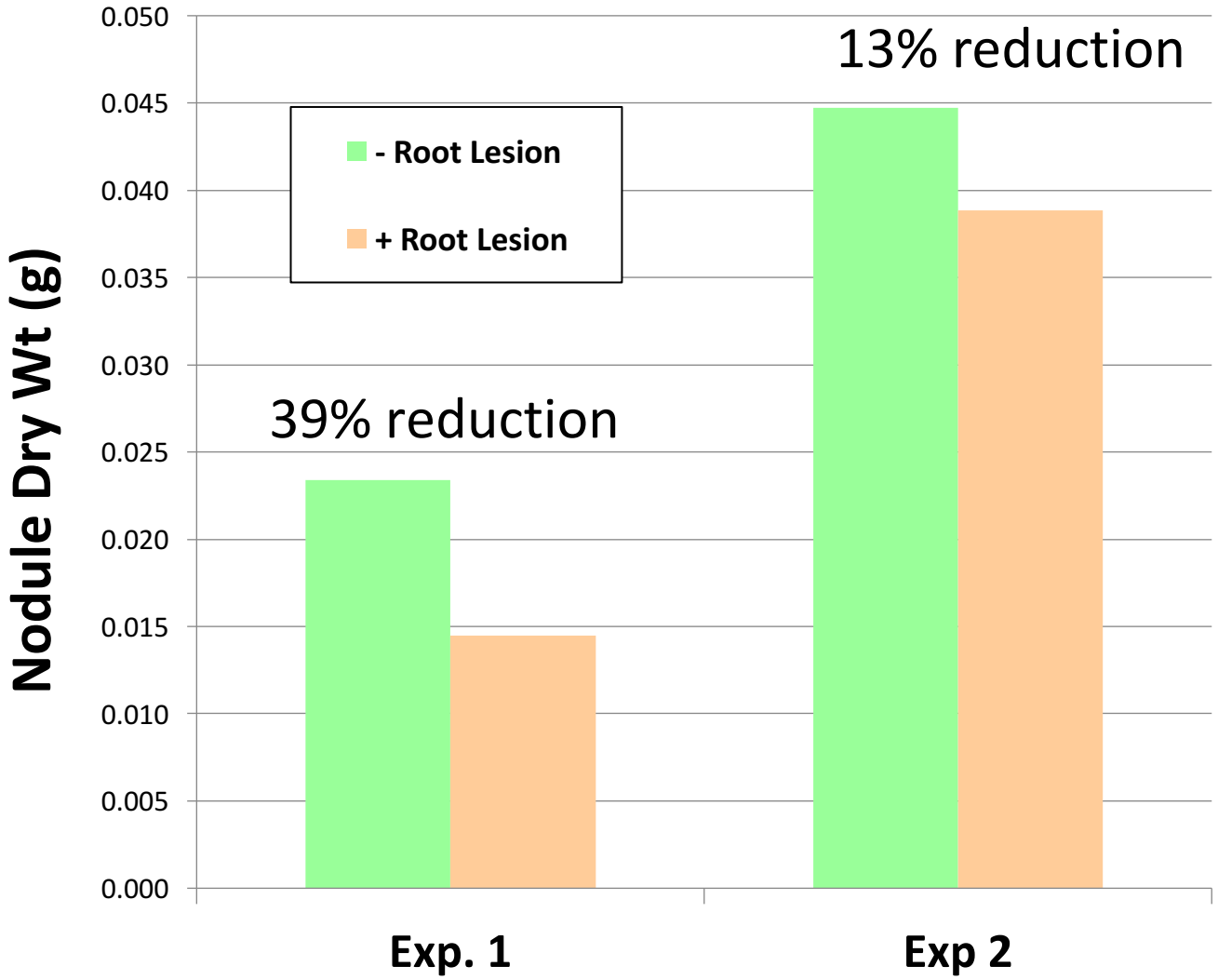
- Controlled experiments indoors
- Controlled inoculations in the field
- Manipulating populations of nematodes in the field
- Correlative studies of natural populations of nematodes in the field



Indoor studies can control:

- #s of nematodes
- Other organisms
- Environment

Soybean roots infected with Root Lesion have lower biomass of nodules



Controlled inoculations in the field require a lot of nematodes!

microplots

direct field inoculation

Fumigated plots Nonfumigated plots

Population densities can be manipulated by selectively killing nematodes in portions of the field

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Solarization reduced population densities of Root Lesion as well as soil fumigation

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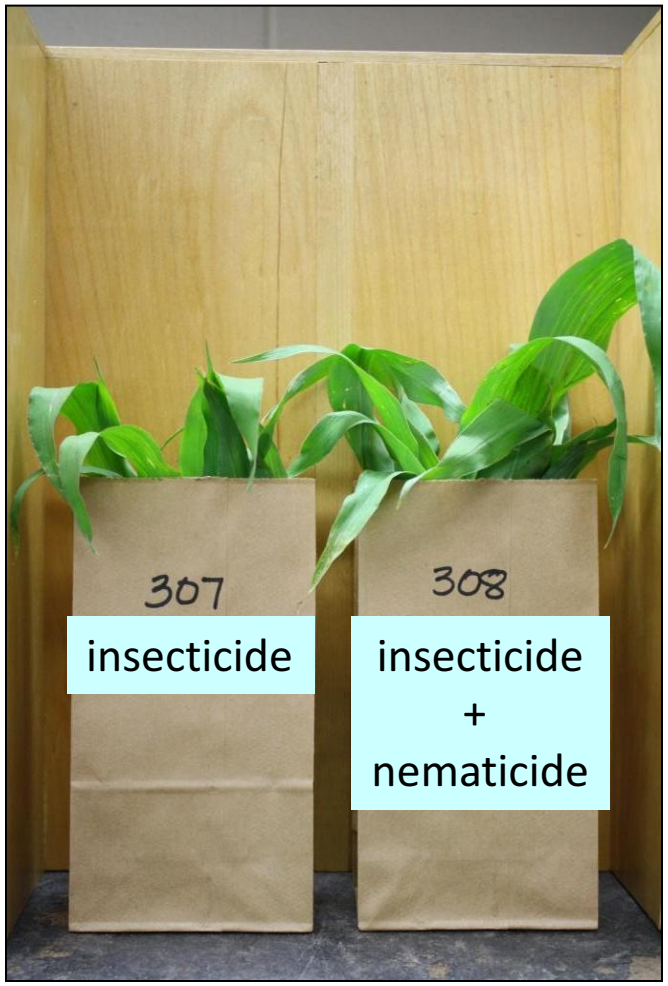


Visual differences at V4

Corn seed treatment
experiment 2012
loamy sand soil

5 corn hybrids with fungicide &

- insecticide only

  or

- insecticide + nematicide

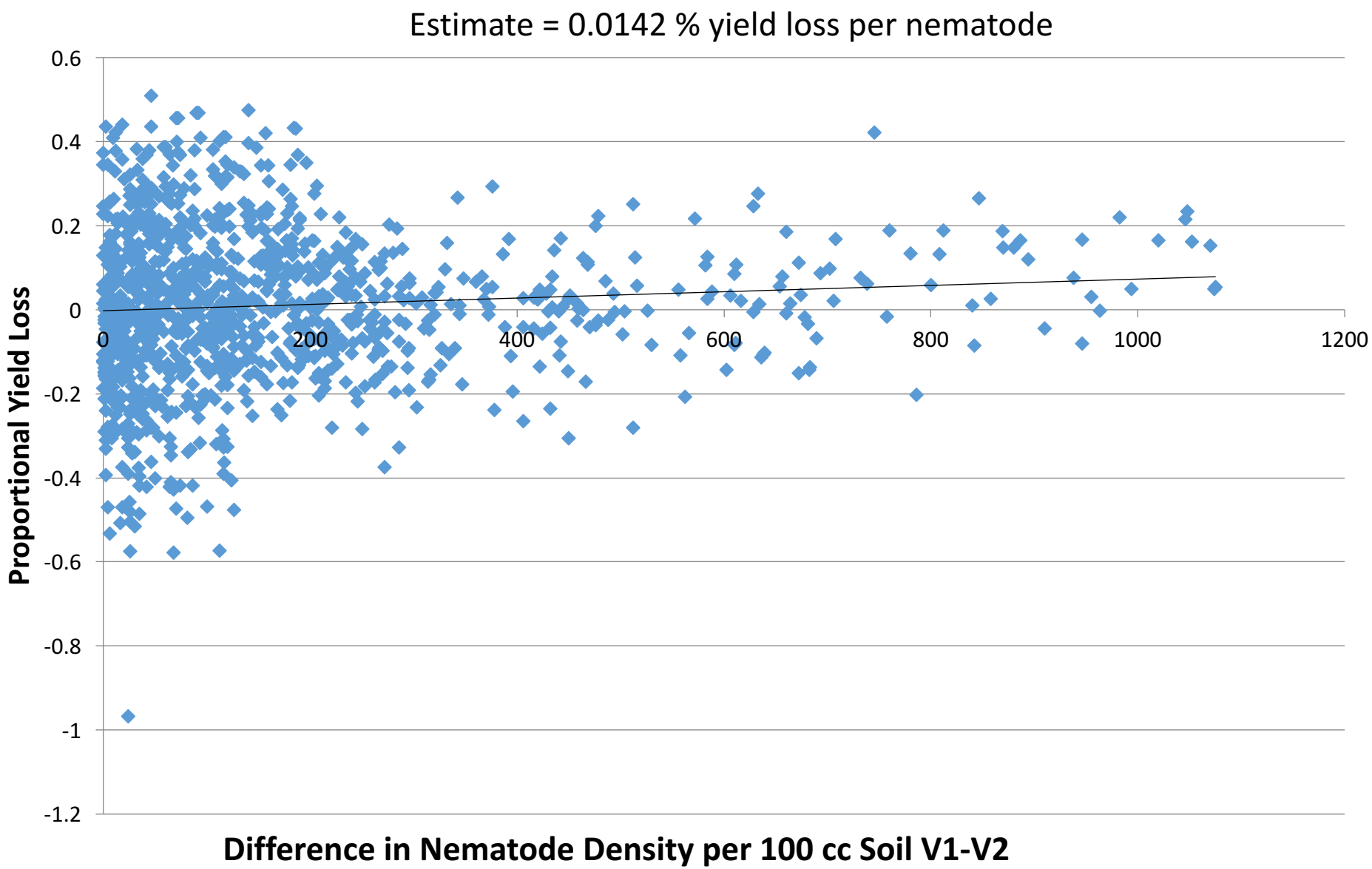
nematicide provided:

5% yield increase - average

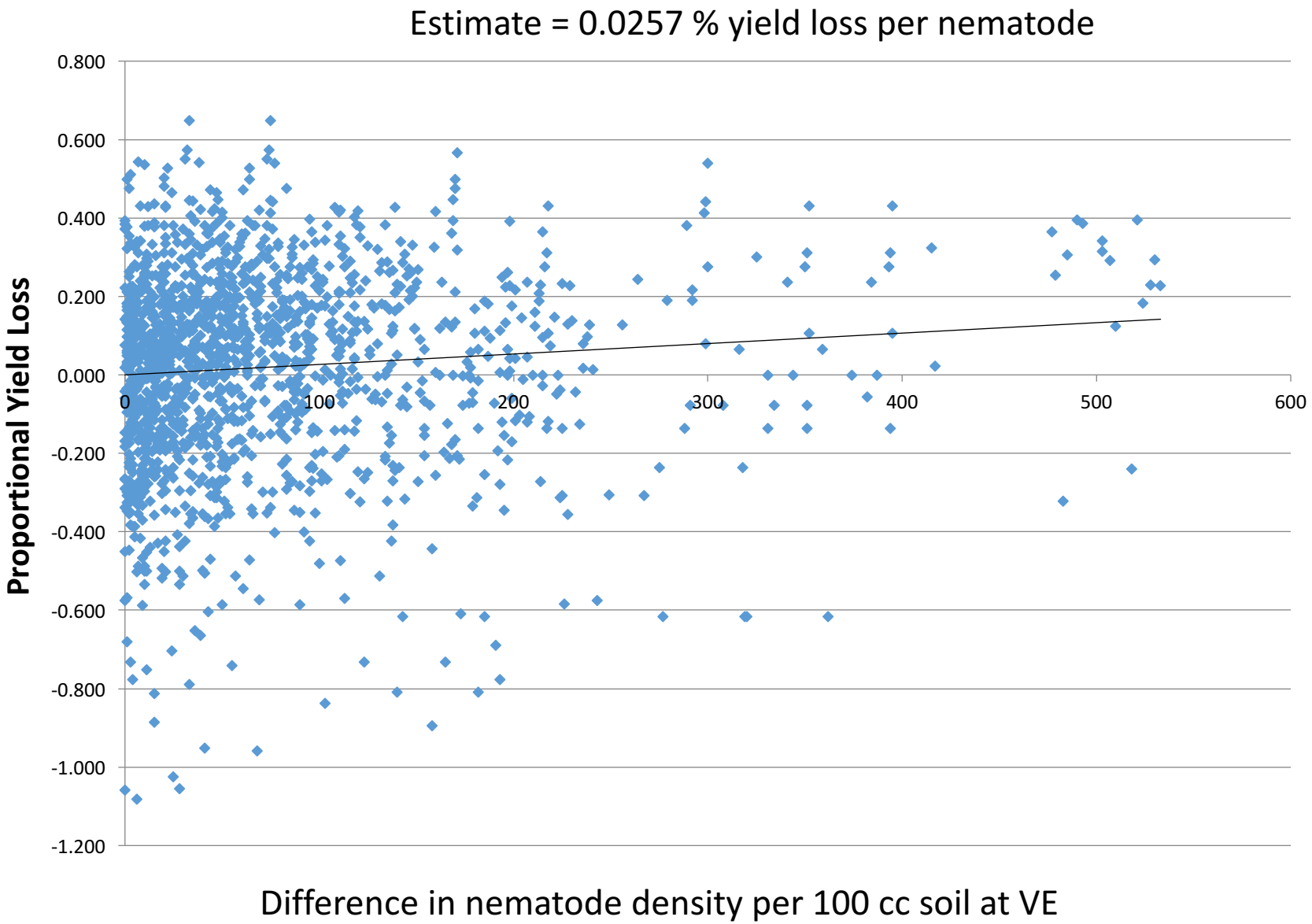
0 – 10% increase - by hybrid

We take advantage of the naturally patchy distribution of Root Lesion in fields to relate initial nematode numbers to yield

damage model for Root Lesion nematodes and corn

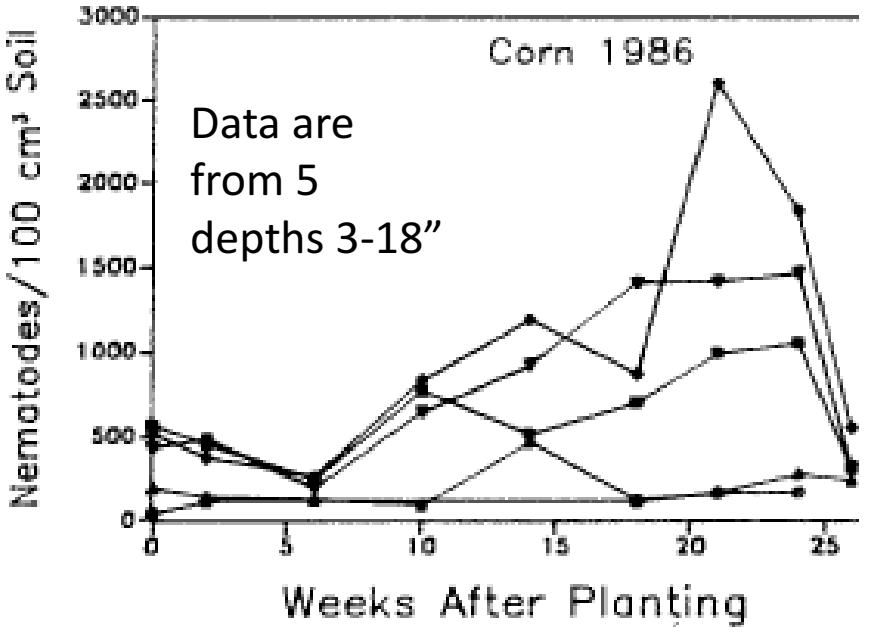


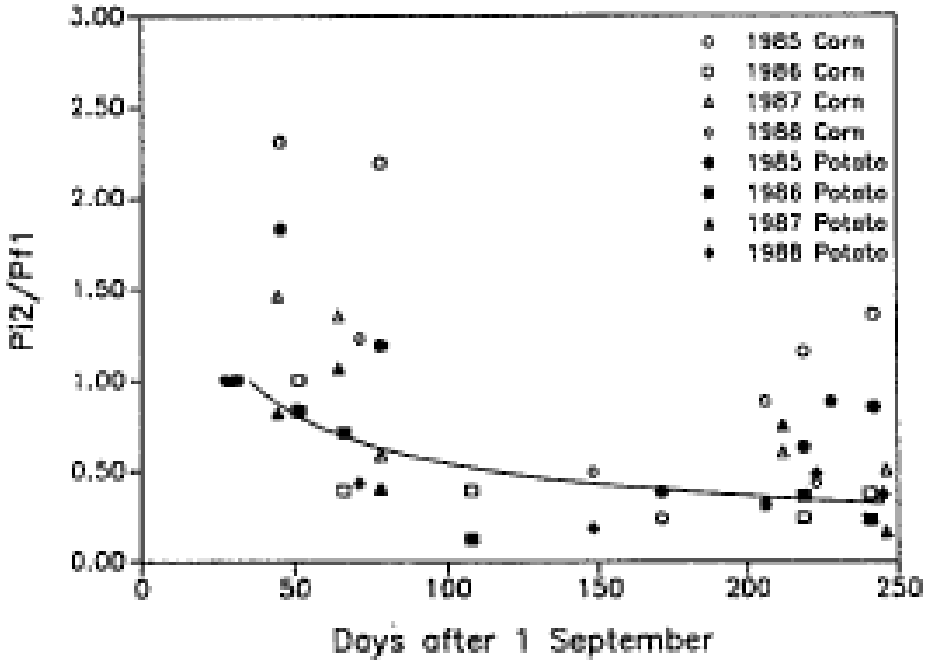
damage model for Root Lesion nematodes and soybean



Research driven management recommendations.....

Populations increase while the crop is growing, decline in the fall, and then level off during the winter so the interpretation of nematode test results is dynamic.

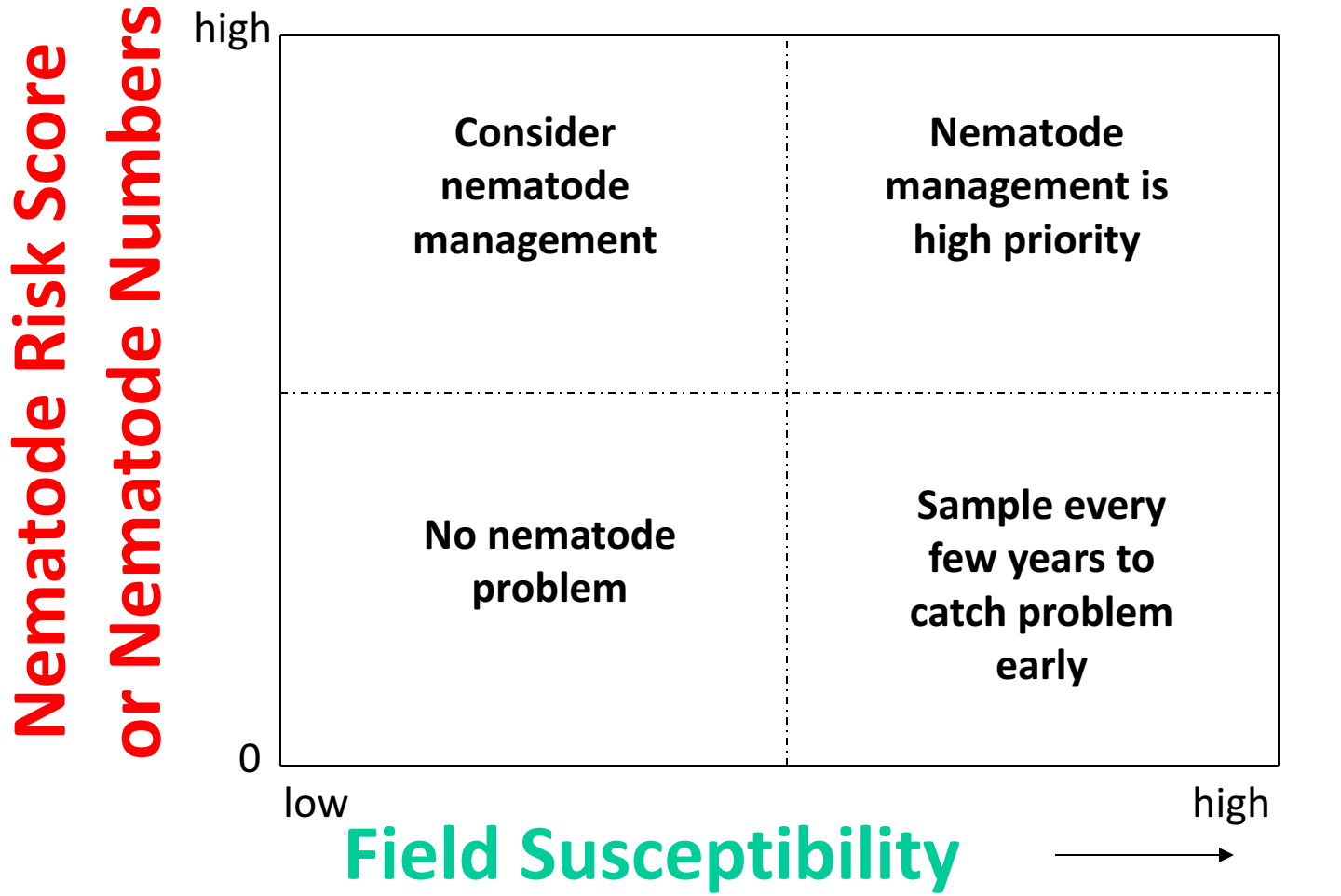




Samples collected <u>during</u> the growing season are useful for estimating the nematode risk for <u>next year’s</u> crop

Not all nematodes are equally damaging – threshold values for soil samples collected from corn fields up to V4

Genus	Common Name	Risk Level That Damage Will Occur		
		low	mod	high
Longidorus	needle			≥1
Hoplolaimus	lance	< 50	51 - 100	> 100
Paratrichodorus	stubby root	< 50	51 - 200	> 200
Pratylenchus	root lesion	< 100	101 - 200	> 200
Xiphinema	dagger	< 100	101 - 200	> 200
Helicotylenchus	spiral	< 500	> 500	
Tylenchorhynchus	stunt	< 500	> 500	
Criconemella	ring	> 500		
Paratylenchus	pin	> 500		



- Soil texture: clay – loam - sand
- Irrigation: yes - no
- Years since last corn crop: many - none

Summary:

Root Lesion nematodes occur in almost every ag. field in WI

Evidence for yield loss due to Root Lesion comes from studies using a variety of approaches.

Estimated yield loss per nematode varies by crop.

The extent of yield loss is related to nematode population density at or close to planting.

Time of sampling influences interpretation of nematode test results – recommendations must account for change in nematode populations between sampling and the next planting date.