



# **Critical Considerations in Managing Nematodes with Potential Trap and Cover Crops**

Haddish Melakeberhan

Agricultural Nematology Laboratory  
College of Agriculture and Natural Resources  
Michigan State University  
102 Ag Hall, East Lansing, MI 48824

[melakebe@msu.edu](mailto:melakebe@msu.edu)

[http://www. agriculturalnematology.anr.msu.edu/](http://www.agriculturalnematology.anr.msu.edu/)

## **Talk Outline:**

**i) Program dimensions**

**ii) Biological approaches to managing nematodes**

**iii) Wise use of trap and cover crops**

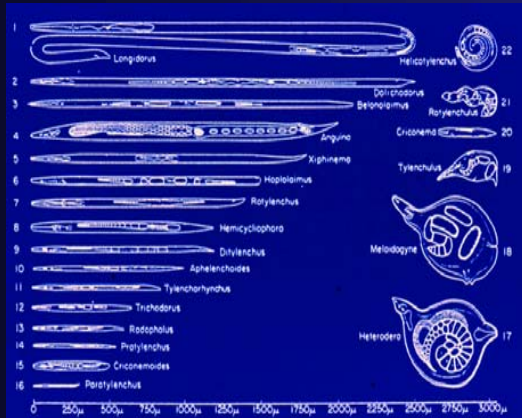
# Program dimensions

**Problematic nematodes in Michigan (Bird *et al.* 2004):**

**Cyst (*Heterodera* spp.)**

**Northern root-knot (NRKN, *Meloidogyne hapla*)**

**Root-lesion (RLN, *Pratylenchus* spp.)**

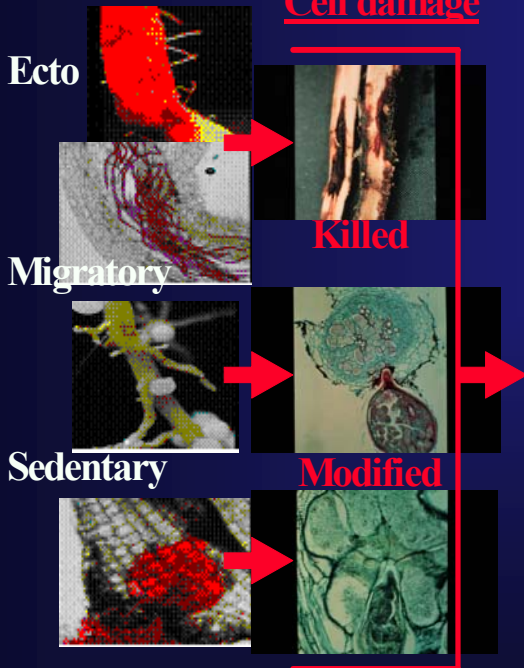


**Umbrella Project:**  
**Physiological basis for an integrated approach**  
**towards sustainable nematode management**

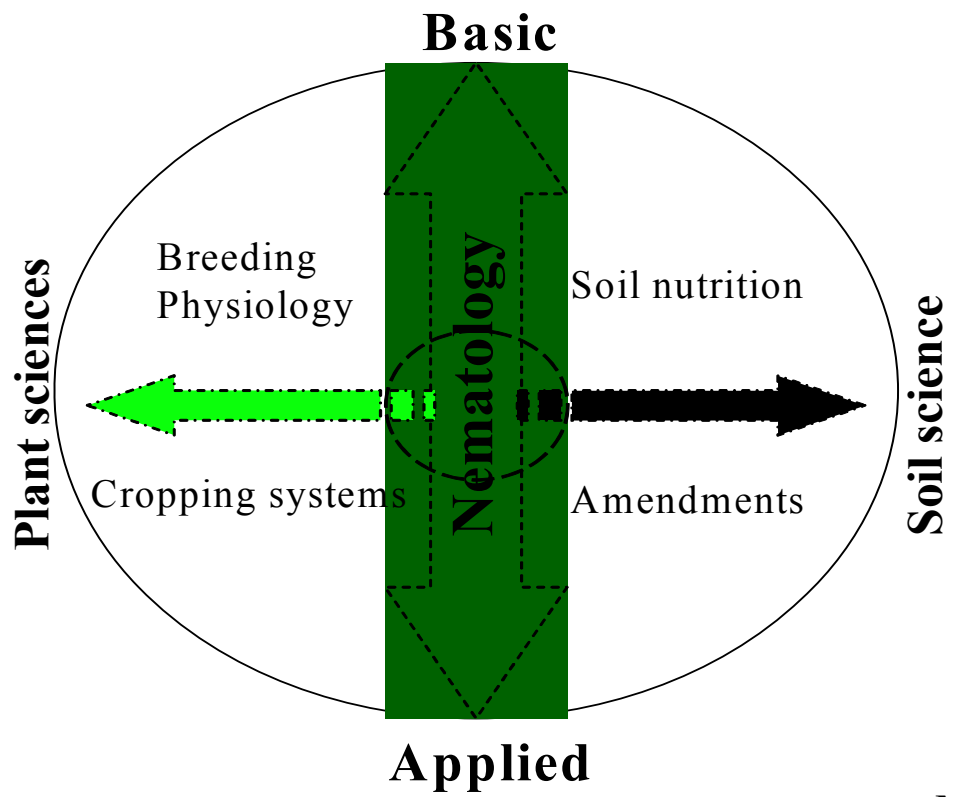
**Central theme:**  
**Organismal to ecosystem level of interactions**

**Theme strategic steps:**  
**I: Host-nematode-nutrient interactions**  
**II: Adaptation and parasitic variability**  
**III: Efficiency of management strategies**

**Parasitism**



# Disciplinary loop and interactions



Melakeberhan, 2007

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**iii) Wise use of trap and cover crops**

## **Contributors:**

M. Ngouajio, S. Kravchenko and T. Dudek (MSU), and  
Eding Brothers (growers)

G. Noel (IL), S. Chen (MN), B. Darby (VT), A. Xu (MIT),  
and S. Mennan (NATO Fellow, Turkey)

# Biological approaches to managing nematodes

Parasitic variability => Revise the “one-size-fits-all” approach

Species and sub-species population biology

Agro-ecosystem complexities

Diversity of soil conditions

Soybean cyst (SCN)

Northern root-knot (NRKN) and

Root-lesion (RLN)

# The Organic Amendment

N-Viro Soil<sup>®</sup> (NVS)

- Recycled municipal biosolid
- Nutrient source
- Liming characteristics



# The Amendment

## N-Viro Soil<sup>®</sup> (NVS)

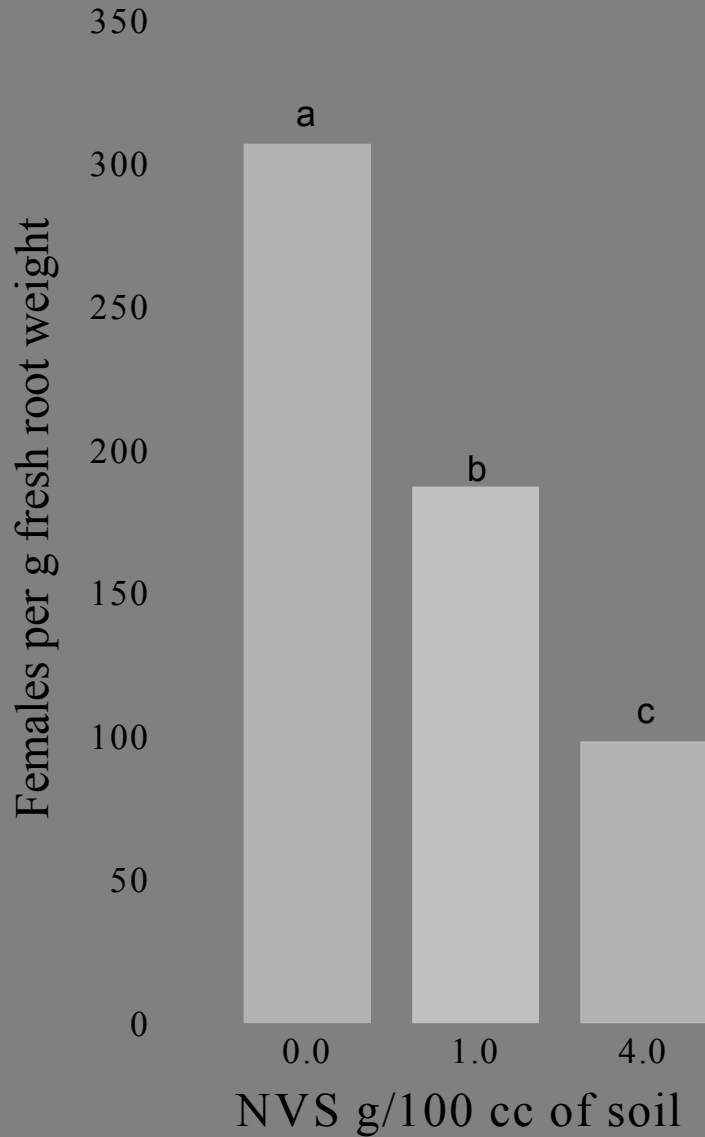
- Recycled municipal biosolid
- Nutrient source
- Liming characteristics

<u>Doses:</u>	<u>g/100 cc</u>	<u>T/A</u>
	0	0
	1	5.90
	4	23.4

# Percent reduction

	Exp. 1		Exp. 2	
	NVS/100 cc		NVS/100 cc	
SCN Races	1	4	1	4
1	74.40	88.54	+170.00	60.20
2	<b>55.53 B</b>	<b>90.33 A</b>	+77.35	61.69
3	65.71	95.36	<b>+3.92 B</b>	<b>61.85 A</b>

# Effect on NRKN



## Doses:

g/100 cc

T/A

0

0

1

5.90

4

23.4

## Conclusions (NVS)

- ▶ Identify species and sub-species nematode complex you have
- ▶ Identify optimum application conditions

## **Feature Article (2008)**

### **Potential of an Alkaline-Stabilized Biosolid to Manage Nematodes: Case Studies on Soybean Cyst and Root-Knot Nematodes**

Inga A. Zasada (USDA), Felicitas Avendano (ISU), Yuncong C. Li (UF), Terry Logan (N-Viro International), Haddish Melakeberhan (MSU), Stephen R. Koenning (NCSU), and Greg L. Tylka (ISU)

***Plant Disease 92:4-13.***

**Wise use of trap and cover crops**

# Brassicas (mustard) multi-purpose use:

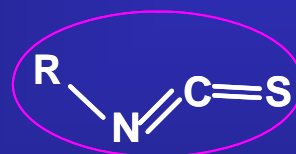
- Trap crop (do not allow full development)

- Cover crop

- Biofumigant (glucosinolate => Isothiocyanate)

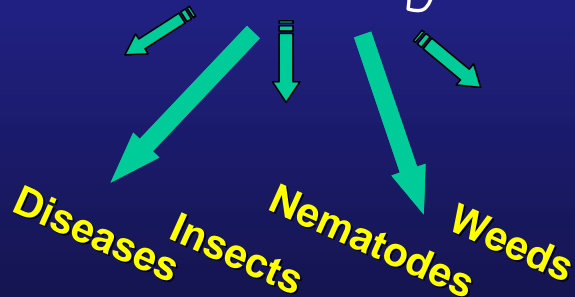
- Vegetable crop (some)

- Combinations

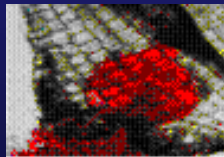


**Isothiocyanate)**

*Activity*



# Promising multi-purpose crops: *Arugula (Eruca sativa L.)*

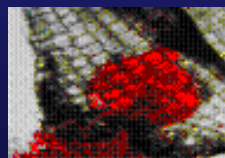


**Traps root-knot**

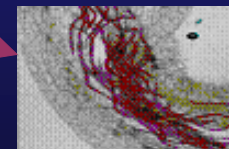
*Nematology 8:793-799*



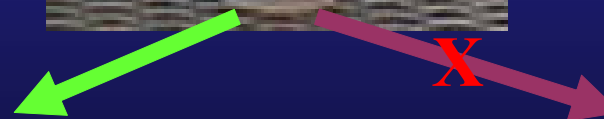
# Promising multi-purpose crops: Arugula (*Eruca sativa* L.)



**Traps root-knot**  
*Nematology* 8:793-799



**Host to root-lesion**



## Wise use of trap crops-Conclusion

- ▶ Know what nematode species you have

# Wise use of cover crops

## OSR's use and growers' concerns:

- Trap crop
- Cover crop
- Biofumigant
- Combinations



NKRN in OSR (Diakon and Ro4S-PSOSR) at 28 days or 504 degree days (base 10 C) after inoculation

<u>Soil types</u>	<u>Nematodes/g fresh root (#)</u>		<u>Dry shoot</u>
	<u>total</u>	<u>% females</u>	<u>Weight (g)</u>
Sandy	104 a	80 a	0.95 c
Loamy sand	31 b	68 b	1.16 a
Muck	10 c	82 a	1.53 a

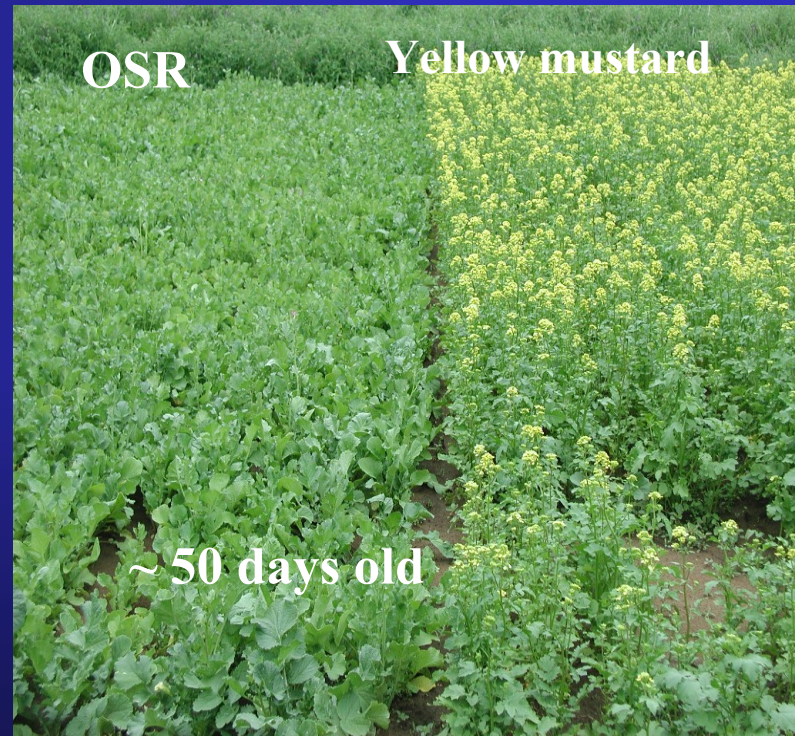
*Nematology 10*:in press

# OSR's use and growers' concerns:

- Trap crop
- Cover crop
- Biofumigant
- Combinations



Our study



0

500

1000

Degree days (base 10 °C)

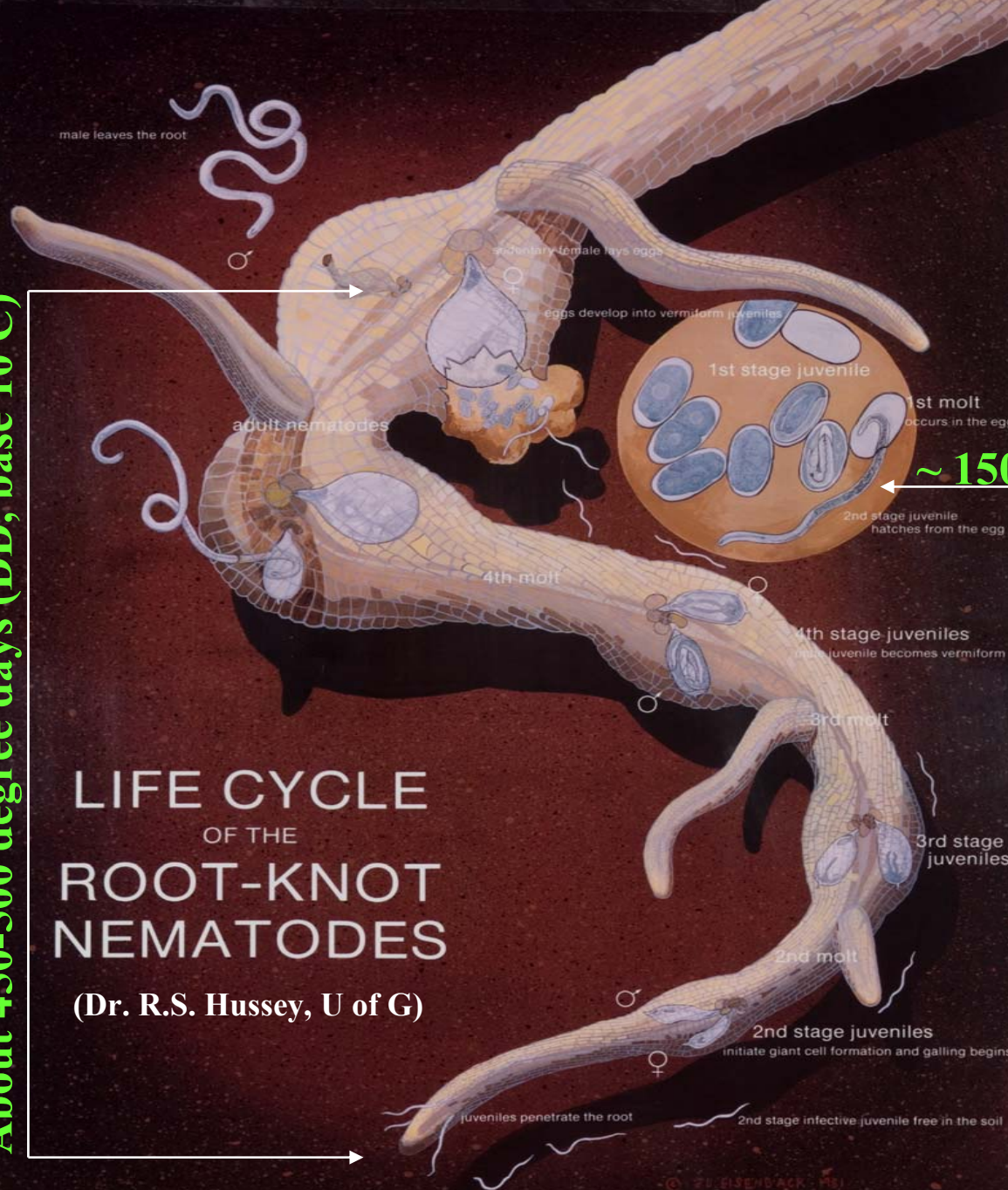
## Wise use of cover crops-Conclusion

- ▶ Know when the target nematode completes a life cycle

About 450-500 degree days (DD, base 10 C)

# LIFE CYCLE OF THE ROOT-KNOT NEMATODES

(Dr. R.S. Hussey, U of G)





# Options in the pipeline for carrots, celery and potato



**SCREENING FOR RESISTANCE (Project GREEN)**

# S

## ACKNOWLEDGEMENTS

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G. Noel (IL), S. Chen (MN), B. Darby (VT), A. Xu (MIT), S. Mennan (Turkey)

### Funding:

Celery Research Inc., Michigan Potato Industry Commission, Michigan  
Department of Agriculture, Michigan Agricultural Experiment Station,  
N-Viro International, Project GREEN

### Technical assistance:

T. Kerchkof, C. Cuevas, and J. Getchel