



MANAGING PLANT-PARASITIC NEMATODES USING TRAP CROPPING AND BIOFUMIGATION

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November 9th, 2016



Plant-parasitic Nematodes



Sunn hemp
Crotalaria juncea
-- monocrotarine

- \$100 billion crop loss worldwide
- \$10 billion loss in USA annually (Chitwood, 2003)
- Root-knot nematodes - most destructive (20-38%)
- Especially damaging to cucurbit crop (lack of resistant cultivars)
- Cover crops provide great potential to suppress plant-parasitic nematodes but are difficult to manage inside a screenhouse



French Marigold (*Tagetes patula* -- α -terthinyI

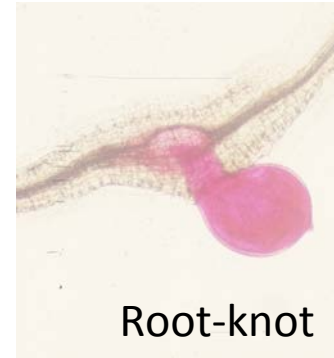
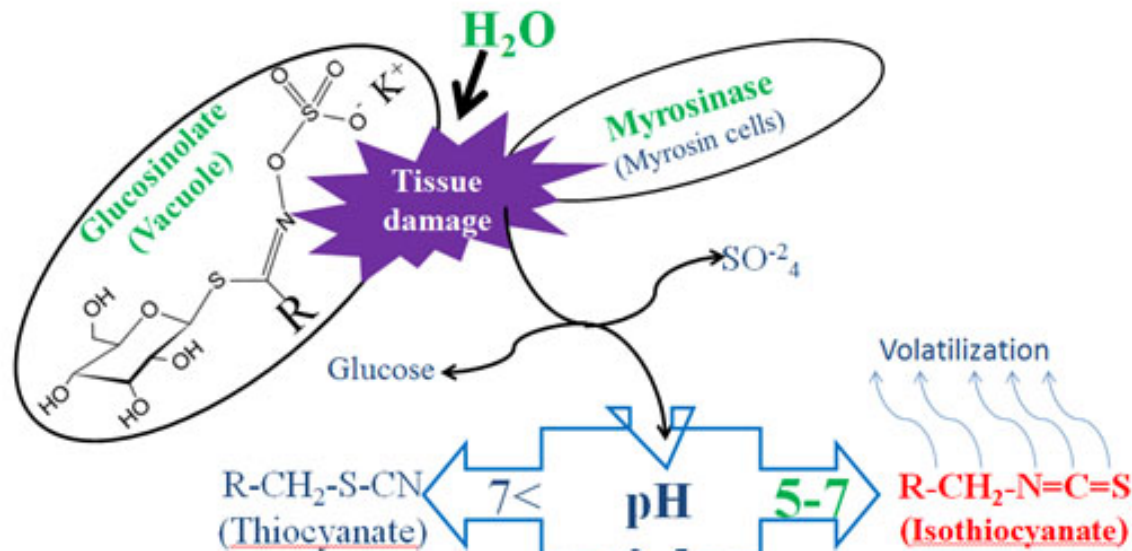


Sorghum-sudangrass
-- Dhurrin



Rapeseed (Canola)
-- glucosinolate

Oil radish (*Raphanus sativus*)



- Biofumigation effect
- Host of *root-knot* and *reniform nematodes* (= trap crop effect)
- Information is needed to enhance biofumigation and trap cropping effects of oil radish



Objectives

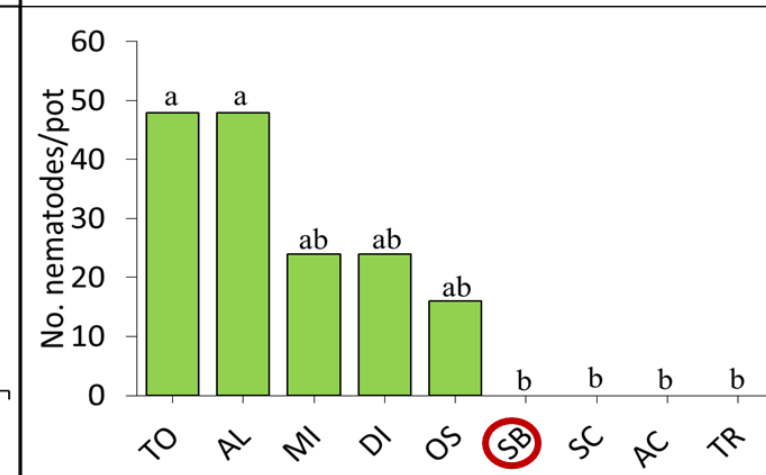
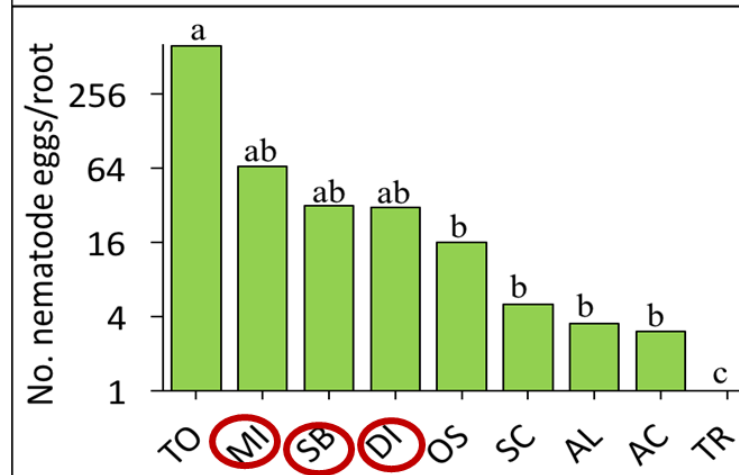
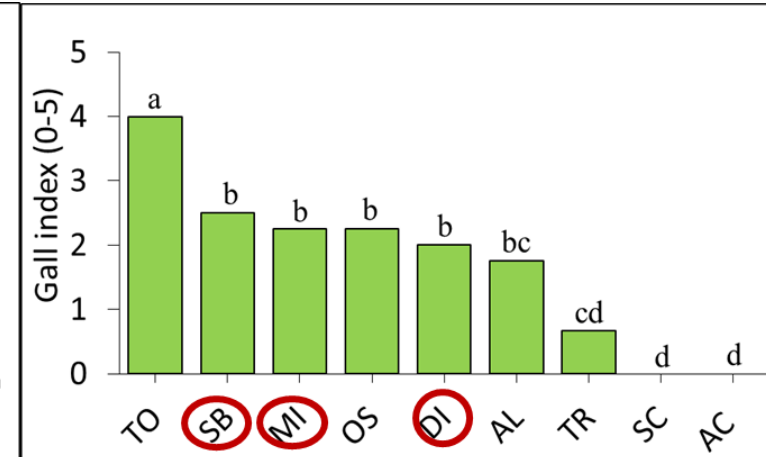
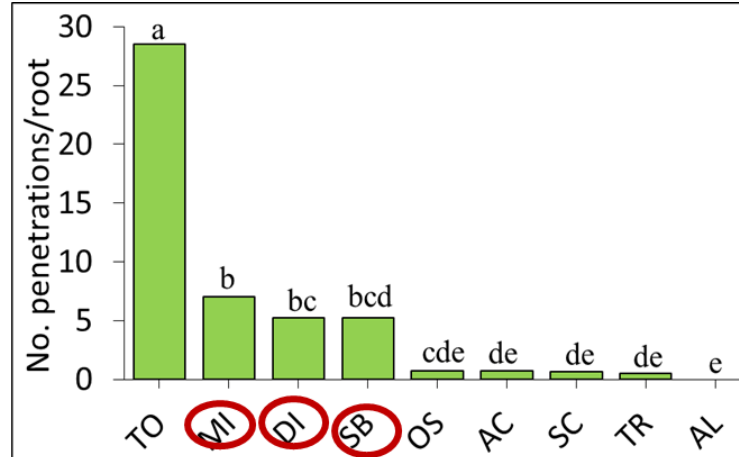
- Screening oil radish cultivars for trap cropping and biofumigation effects against root-knot and reniform nematodes.
- To determine best termination time of oil radish in a field trial.

1.1 Susceptibility of radish cultivars to *M. javanica*

Trap Cropping Effect

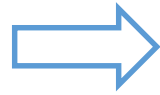


8 oil radish cvs + 'Orange Pixie' tomato inoculated with root-knot nematodes, examine for 1 month.



TO = Orange Pixie; MI = Miyashige; DI = Discovery; SB = Sodbuster; OS = Oshin; AC = April Cross; SC = Summer Cross; TR = Tillage Radish; AL = Alpine.

Biofumigation Effect

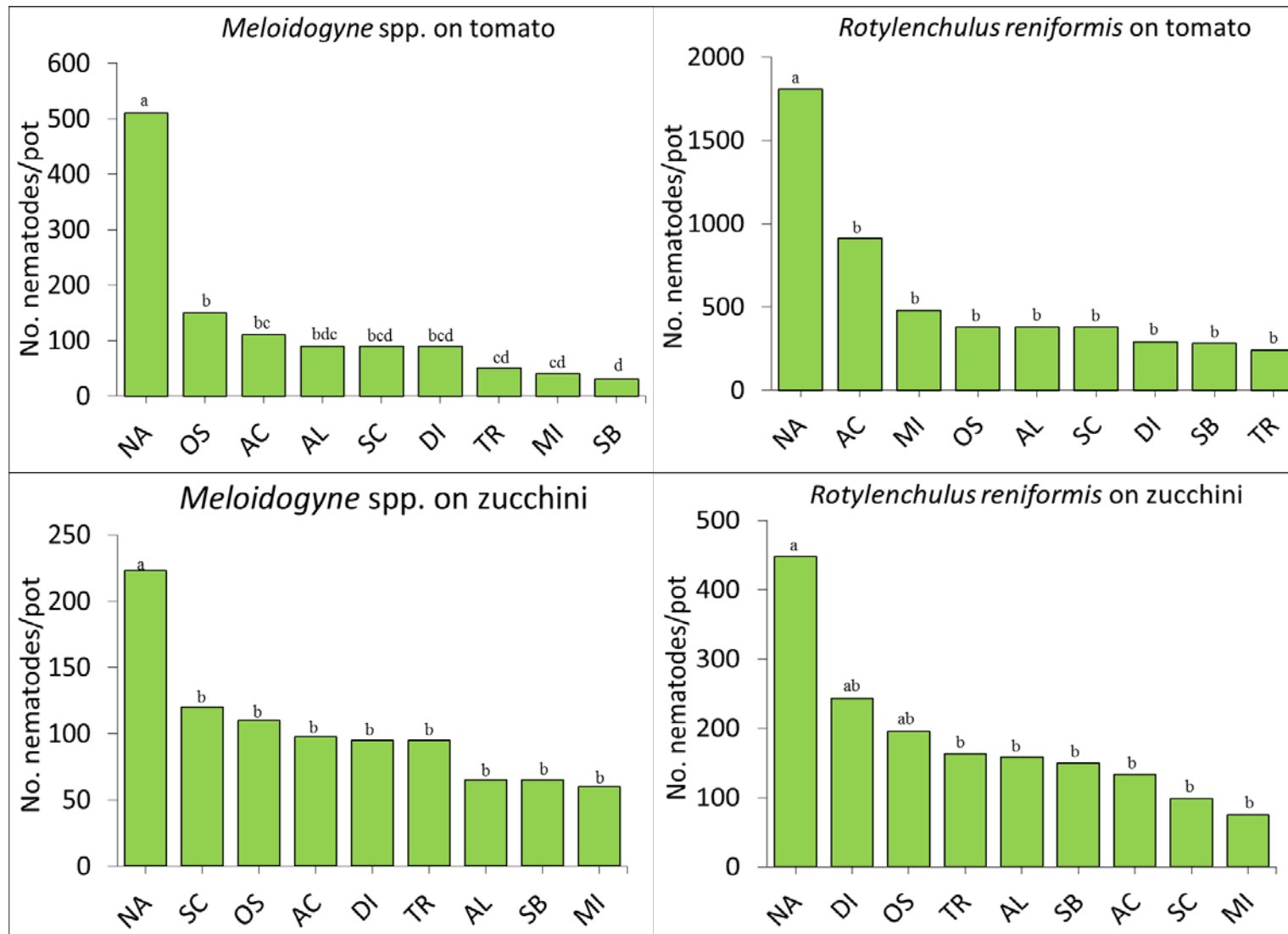


Nematode infested soil was amended with 1% (w/w) residues of 8 oil radish cvs. and compared to unamended control, 'Orange Pixie' tomato was used as bioassay crop.



Plant growth difference on tomato 'Orange Pixie'

Biofumigation Effect of Oil Radish to *Meloidogyne* spp. and *R. reniformis*



NA = no amendment; AC = April Cross; AL = Alpine; MI = Miyashige; OS = Oshin; SB = Sodbuster; SC = Summer Cross; TR = Tillage Radish

Objectives

- Screening oil radish cultivars for trap cropping and biofumigation effects against root-knot and reniform nematodes.
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Field Trial

Growing period of Oil Radish as a
Cover Crop

8 weeks

6 weeks

4 weeks

2 weeks

0 week

Termination of oil radish



Oil radish was planted for different length of time (0, 2, 4, 6 and 8 weeks). Experiment was arranged in RCBD with 4 replications. Pumpkin was planted after oil radish (OR) termination and incorporation, nematodes were sampled at OR termination and at 4 weeks after pumpkin planting.

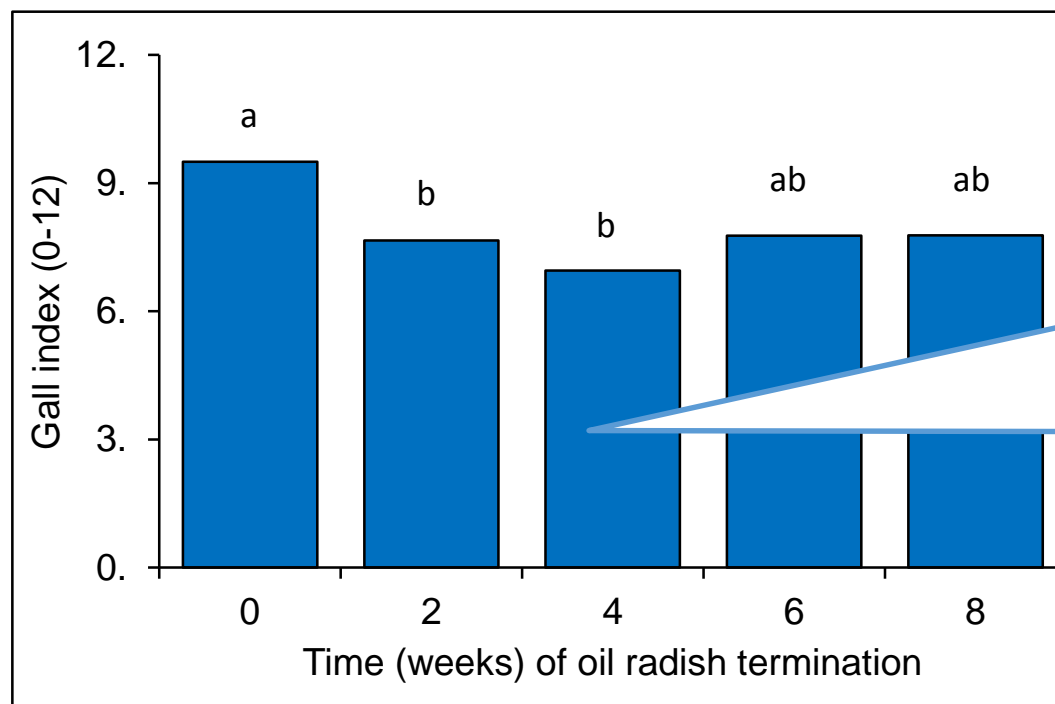
Oil radish did not suppress PPN in the soil but reduce root galls on pumpkin

RGI = 0



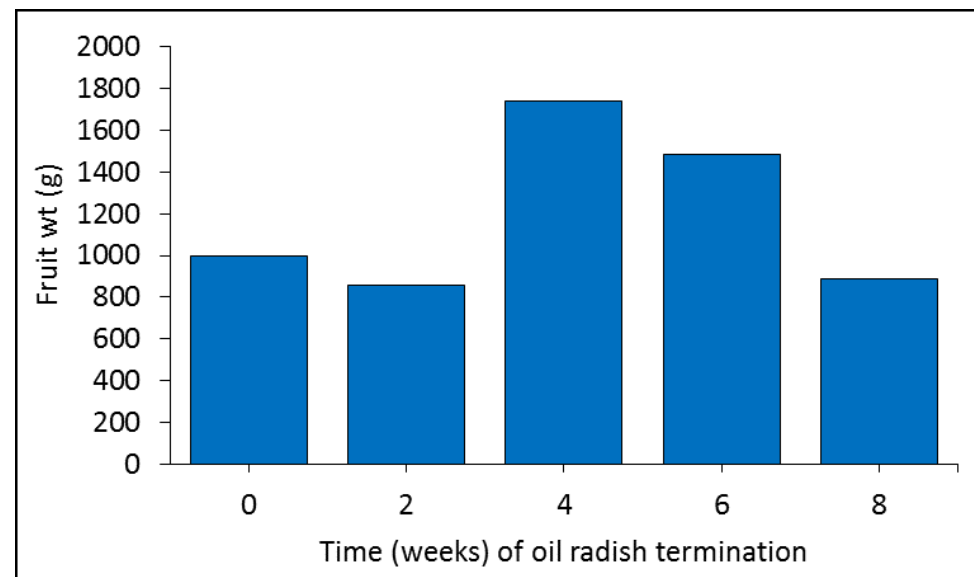
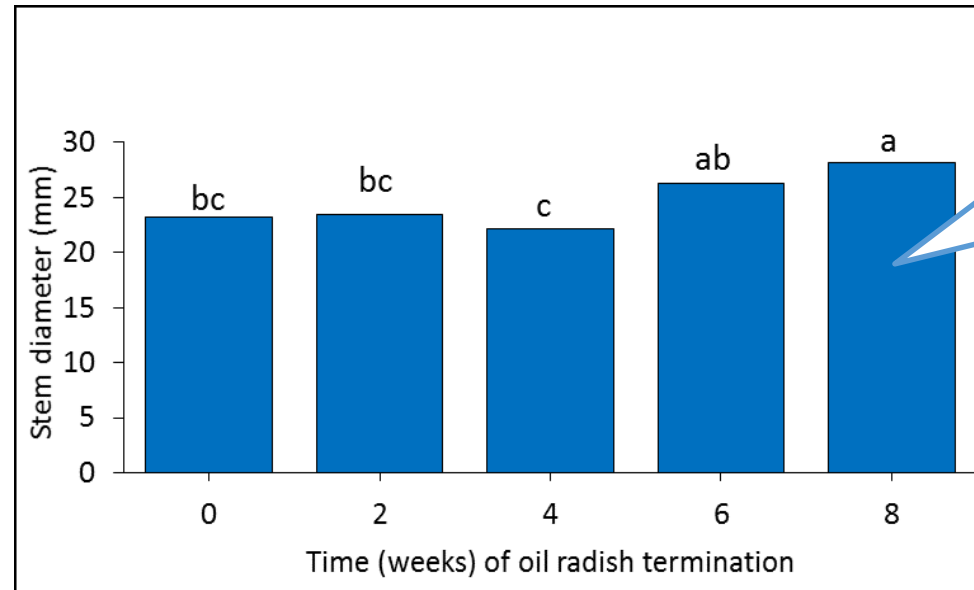
Repeated measure over 3 sampling dates at monthly interval

Herbivores	Nematodes/250 cm ³ soil				
	0	2	4	6	8
Root-knot nematode	178 A	140 A	213 A	160 A	467 A
Reniform nematode	371 A	256 A	874 A	168 A	312 A
Stubby root nematode	36 A	20 A	32 A	22 A	33 A



4-wk OR trapped RKN most efficiently without letting the nematodes accumulate sufficient heat units to go into multiple reproduction cycles

Planting oil radish for 8 weeks increased pumpkin growth



Implication and Future Research to Improve Biofumigation Effects



'Sodbuster' Oil radish

4 weeks after oil radish growth:

Till

1. Till and soil incorporated



2. Till, soil incorporated, cover with solarization mulch (1 wk) to enhance biofumigation



Solarization

No-till

3. Flail mowed to increase tissue maceration



Flail mowed

4. Flail mowed and cover with weed mat to capture isothiocyanate for 1 wk.



Acknowledgements

Funding source



Sustainable Pest Management Lab

University of Hawaii at Manoa,
College of Tropical Agriculture and Human Resources

Adviser: Dr. Koon-Hui Wang

Dissertation committees: Dr. Brent Sipes, Dr. Zhiqiang Cheng, Dr. Joe DeFrank and Dr. James Leary

Technical support staff: Donna Meyer, Gareth Nagai and Steve Yoshida

Poamoho Experiment Station: Farm crew

Extension Agents: Jensen Uyeda and Jari Sugano

Shova Mishra
Shelby Ching
Josiah Marquez
Jonathan Kam

