



# MANAGING PLANT-PARASITIC NEMATODES USING TRAP CROPPING AND BIOFUMIGATION

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# *Plant-parasitic Nematodes*



Sunn hemp  
*Crotalaria juncea*  
-- monocrotaline

- \$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* --  $\alpha$ -terthinyI



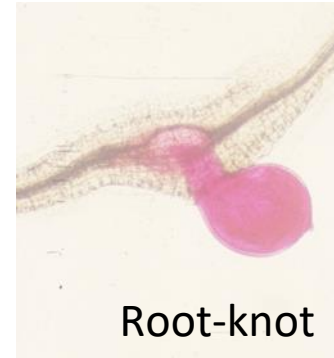
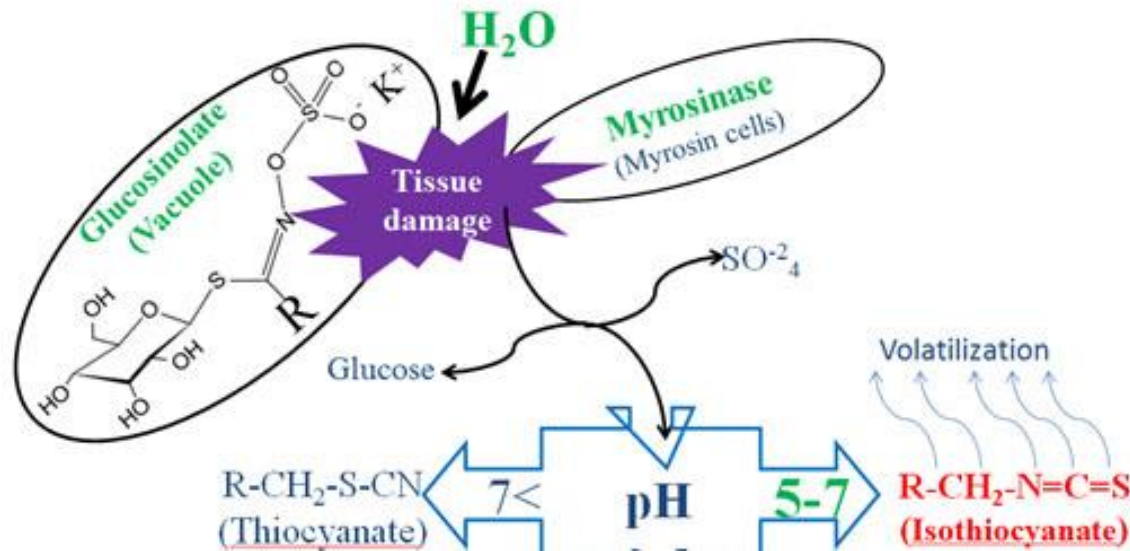
Sorghum-sudangrass  
-- Dhurrin



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

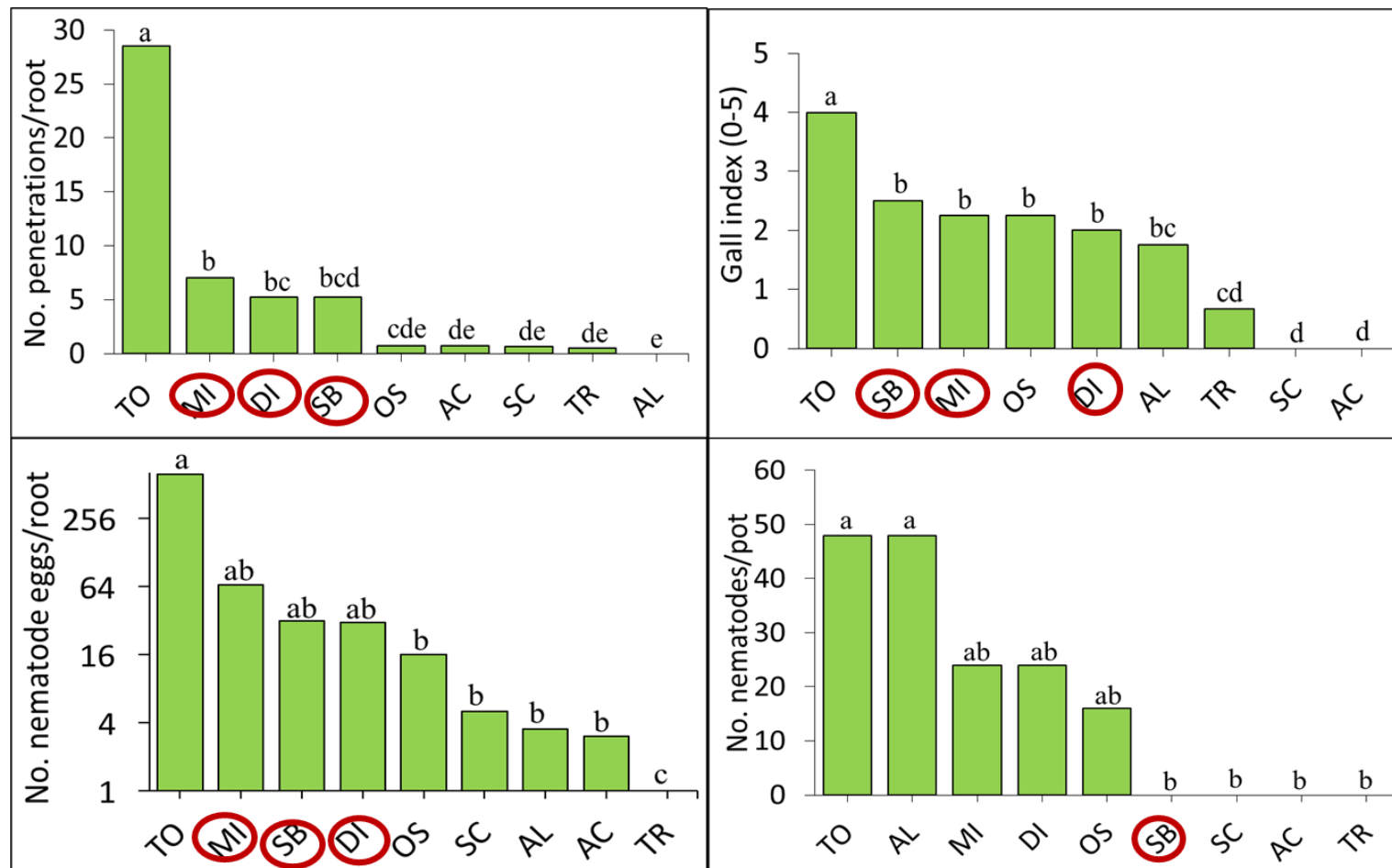
- Screening oil radish cultivars for trap cropping and biofumigation effects against root-knot and reniform nematodes.
- To determine best termination time of oil radish in a field trial.

# 1.1 Susceptibility of radish cultivars to *M. javanica*

## Trap Cropping Effect



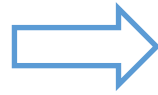
8 oil radish cvs + 'Orange Pixie' tomato inoculated with root-knot nematodes, examine for 1 month.



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



## Biofumigation Effect

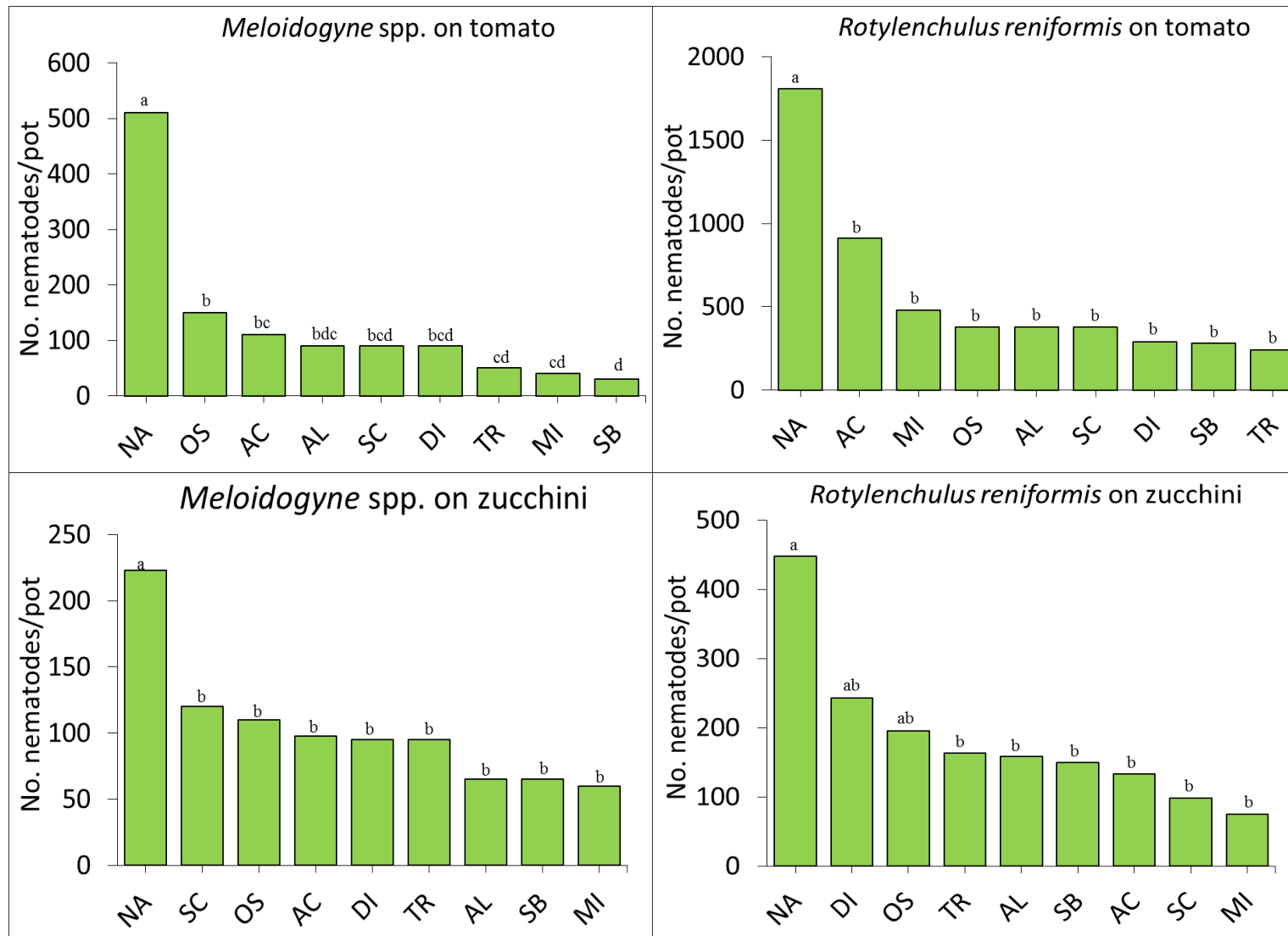


Nematode infested soil was amended with 1% (w/w) residues of 8 oil radish cvs. and compared to unamended control, 'Orange Pixie' tomato was used as bioassay crop.



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.
- To determine best termination time of oil radish in a field trial.



## Field Trial



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 induce root galls on pumpkin

RGI = 0



Repeated measure over 3

4-wk OR trapped monthly interval

Herbivores

Root-knot nematode

17

Reniform nematode

37

Stubby root nematode

36

4-wk OR trapped  
RKN most efficiently  
without letting the  
nematodes

accumulate

sufficient heat units

to go into multiple

reproduction cycles

oil

6

8

60 A

467 A

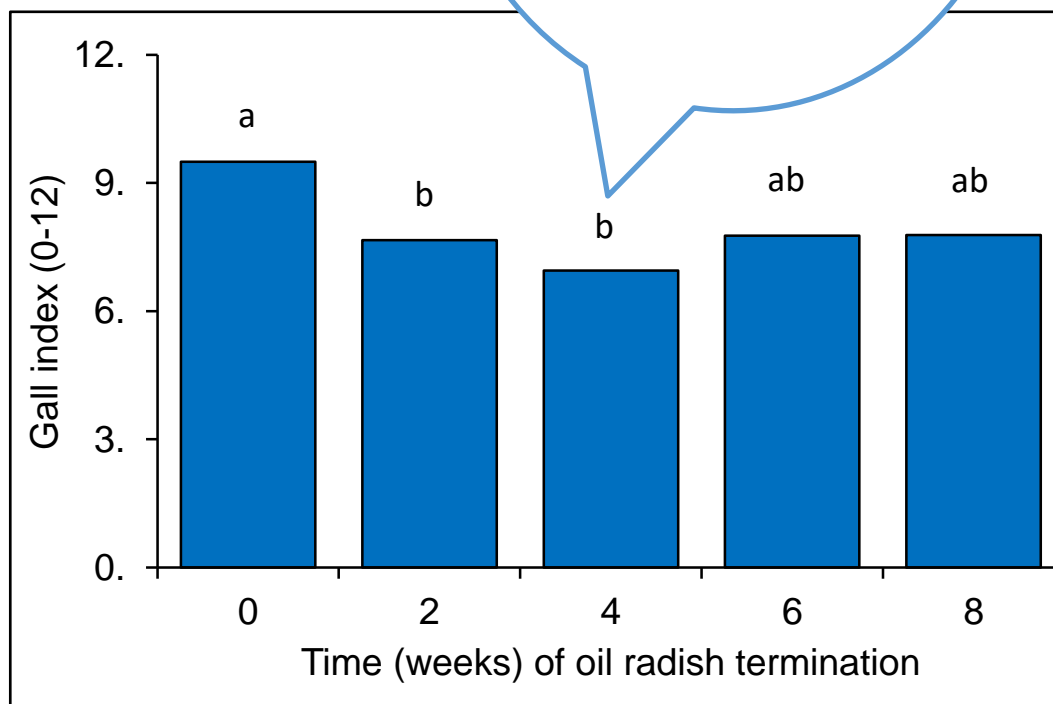
58 A

312 A

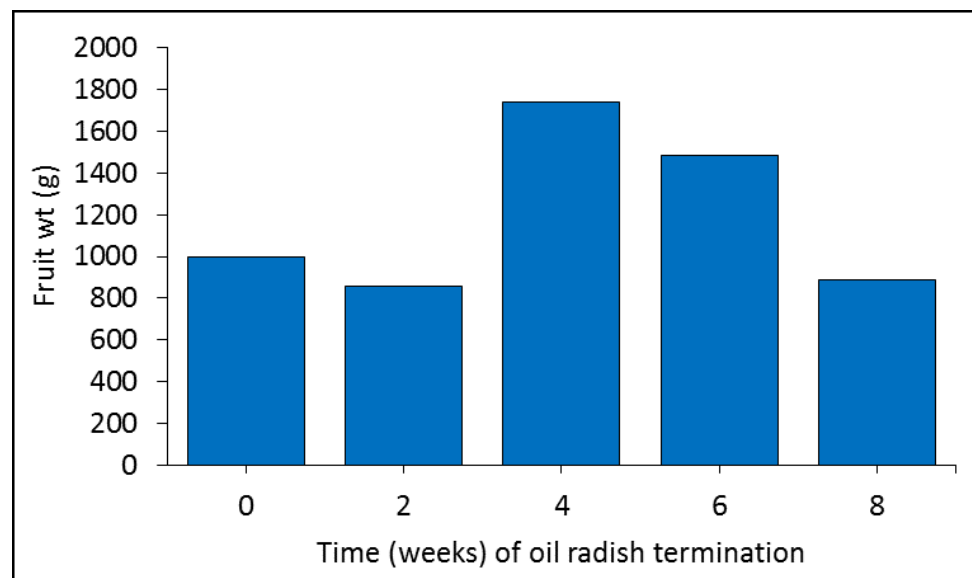
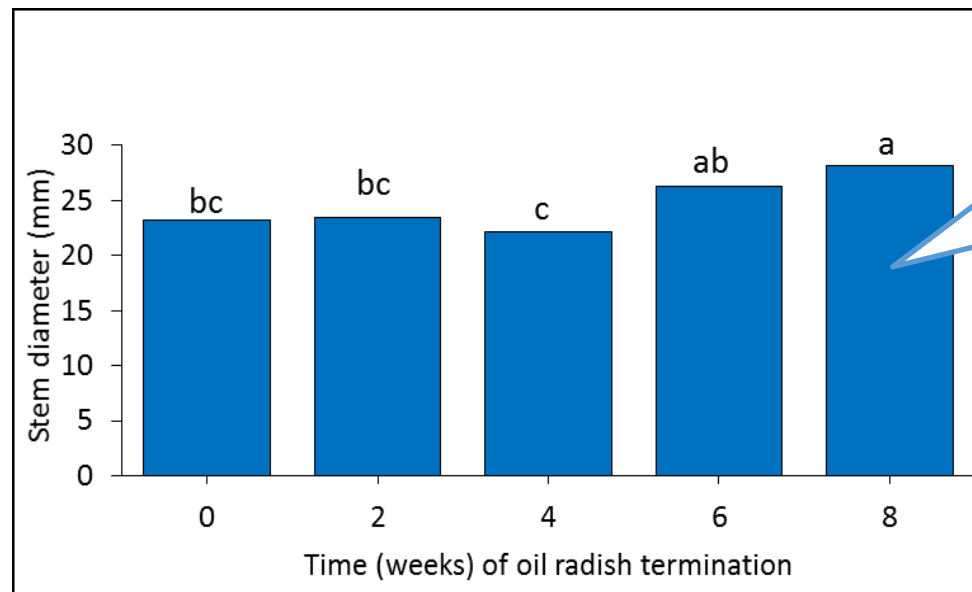
22 A

33 A

RGI = 12



## Planting oil radish for 8 weeks increased pumpkin growth





## Implication and Future Research to Improve Biofumigation



'Sodbuster' Oil radish

4 weeks after oil radish

Hand  
Tiller

Weed  
wacker



Solarization



Reduce  
volatilization

1 week

Weed  
suppression



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