MANAGING PLANT-PARASITIC NEMATODES USING TRAP CROPPING AND BIOFUMIGATION

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Plant-parasitic Nematodes

- $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

Sunn hemp
*Crotalaria juncea* -- *monocrotarine*

French Marigold (*Tagetes patula* -- *α-terthynyl* )

Rapeseed (Canola) -- glucosinolate

Sorghum-sudangrass -- Dhurrin
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*

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

*Trap Cropping Effect*

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.
Growing period of Oil Radish as a Cover Crop

- 8 weeks
- 6 weeks
- 4 weeks
- 2 weeks
- 0 week

Termination of oil radish

- 2 weeks
- 6 weeks
- 4 weeks
- 8 weeks

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

Repeated measure over 3 sampling dates at monthly interval

<table>
<thead>
<tr>
<th>Herbivores</th>
<th>Nematodes/250 cm³ soil</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Root-knot nematode</td>
<td>178 A</td>
</tr>
<tr>
<td>Reniform nematode</td>
<td>371 A</td>
</tr>
<tr>
<td>Stubby root nematode</td>
<td>36 A</td>
</tr>
</tbody>
</table>

RGI = 0

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

Gall index (0-12) over time:

- **a**
- **b**

- **ab**
Planting oil radish for 8 weeks increased pumpkin growth

Green manure effect
Implication and Future Research to Improve Biofumigation Effects

‘Sodbuster’ Oil radish

4 weeks after oil radish growth:

1. Till and soil incorporated

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

3. Flail mowed to increase tissue maceration

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