Chemical and biological nematicide testing in tomato

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2 tomato field trials – October and March

- Fluensulfone (**Nimitz**), fluopyram (**Velum**) and fluazaindolizine (**Salibro**), applied via drip tape (1 or 2), either by themselves or combined with other nematicides (**fumigants** and **Vydate**)

- Biologicals: **Majestene** and **Melocon**

- Efficacy against root-knot nematodes

- Effects on plant vigor and yield

- Impact on non-plant parasitic nematode groups
## New fluorine (3-F) nematicicides

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Trade name</th>
<th>Structure</th>
<th>Soil movement / solubility (water)</th>
<th>Soil ½ life</th>
<th>MOA</th>
<th>Tox. Cat.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fumigants (1,3-D)</td>
<td>Many</td>
<td><img src="image1" alt="Structure" /></td>
<td>Good- Gas</td>
<td>Short &lt; 14 d</td>
<td>?</td>
<td>Danger</td>
</tr>
<tr>
<td>Oxamyl</td>
<td>Vydate</td>
<td><img src="image2" alt="Structure" /></td>
<td>Good- 240,000 ppm</td>
<td>Short 7 d</td>
<td>AChEI</td>
<td>Danger</td>
</tr>
<tr>
<td>Fluensulfone</td>
<td>Nimitz</td>
<td><img src="image3" alt="Structure" /></td>
<td>Medium- 545 ppm</td>
<td>Short 7-17 d</td>
<td>?</td>
<td>Caution</td>
</tr>
<tr>
<td>Fluopyram</td>
<td>Velum</td>
<td><img src="image4" alt="Structure" /></td>
<td>Poor – 10 ppm</td>
<td>Long &gt; 200 d</td>
<td>SDHI</td>
<td>Warning</td>
</tr>
<tr>
<td>Fluazaindolizine</td>
<td>Salibro</td>
<td><img src="image5" alt="Structure" /></td>
<td>Medium+ 2000 ppm</td>
<td>Medium 30 d</td>
<td>?</td>
<td>TBD</td>
</tr>
</tbody>
</table>

New products are less toxic and more selective – true nematicides
New modes of action – or unknown;
Different soil behavior – efficacy and application
Tomato Trial, Gulf Coast REC, October 2016

Beach sand … root-knot nematode = Meloidogyne javanica
Root gall ratings on tomato (0-10)

All nematicides reduced gall ratings end of the season

Low-medium RKN pressure
Root-knot nematode soil counts - end of season

Pre-plant and post-treatment soil counts were very low (0-1 J2 / 200 cc soil)

UTC highest root-knot counts; no difference among other PPN: stubby, lance, sting, lesion, spiral, ring, sheath nematodes

<table>
<thead>
<tr>
<th>Treatment</th>
<th>J2's/200 cc soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 pt</td>
<td>ab</td>
</tr>
<tr>
<td>7 pt</td>
<td>b</td>
</tr>
<tr>
<td>3.5 pt + Vydate</td>
<td>ab</td>
</tr>
<tr>
<td>1 lb</td>
<td>b</td>
</tr>
<tr>
<td>1 lb + Vydate</td>
<td>b</td>
</tr>
<tr>
<td>2 Qt + 1</td>
<td>b</td>
</tr>
<tr>
<td>2 Qt + Velum</td>
<td>b</td>
</tr>
<tr>
<td>6.5 oz + Vydate</td>
<td>ab</td>
</tr>
<tr>
<td>60 gal</td>
<td>ab</td>
</tr>
<tr>
<td>K-pam</td>
<td></td>
</tr>
<tr>
<td>UTC</td>
<td>a</td>
</tr>
</tbody>
</table>

UTC highest root-knot counts; no difference among other PPN: stubby, lance, sting, lesion, spiral, ring, sheath nematodes.
Plant vigor (NDVI) during the season

3-F nematicides similar crop vigor, in between check and K-pam
# Tomato Fruit Yield - 3 picks

*No difference 1st and 2nd pick; K-pam greatest 3rd pick*

<table>
<thead>
<tr>
<th>Product</th>
<th>1st pick</th>
<th>2nd pick</th>
<th>3rd pick</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nimitz 3.5 pt</td>
<td>a</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>Nimitz 7 pt</td>
<td>b</td>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td>Nimitz 3.5 pt + Vydate</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>Salibro 1 lb</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>Salibro 1 lb + Vydate</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>Vydate 2 Qt + 1</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>Velum 6 Qt + 1</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>Kpam 60 gal</td>
<td>a</td>
<td>b</td>
<td>b</td>
</tr>
</tbody>
</table>

**Sclerotium rolfsii**

LBS PER PLOT

10/2/2017
Nematode feeding groups in tomato - Early season, 10-20 days post-treatment

(a) bacterial feeder, (b) fungal feeder, (c) plant feeder, (d) predator, (e) omnivore.

Bacterivores  Fungivores (P<0.01)  Omnivores (P<0.01)  Herbivores

K-pam
Check
Vydate
Salibro
Velum
Nimitz Full
Nimitz Half

Fungivores, omnivores and herbivores knocked out ... no effect of new nematicides

Number per 150 cc soil
Nematode feeding groups in tomato - Late season, 120 days post-treatment

Herbivores dominate, minor differences among other feeding groups
Tomato Trial, Gulf Coast REC, March 2017

<p>| | | | | | |</p>
<table>
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<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PicClor60</td>
<td>No fumigant</td>
<td>Pic100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Chemical / biological</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>
Organic Nematicides in tomato

New fluorine (3-F) nematicides

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<th>Tax. Cat.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluoroxycone</td>
<td>Nimitz</td>
<td></td>
<td>Good - 600 ppm</td>
<td>Short &gt; 21 d</td>
<td>?</td>
<td>Caution</td>
</tr>
<tr>
<td>Melaoxone</td>
<td>Velum</td>
<td></td>
<td>Poor - 5 ppm</td>
<td>Long &gt; 90 d</td>
<td>ROEL</td>
<td>Warning</td>
</tr>
<tr>
<td>Fluopyram</td>
<td>Velum</td>
<td></td>
<td>Poor - 5 ppm</td>
<td>Long &gt; 90 d</td>
<td>ROEL</td>
<td>Warning</td>
</tr>
</tbody>
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New products are less toxic and more selective – true nematicides
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Different soil behavior – efficacy and application

- **Nimitz**: 7 pt, 7 Days before planting
- **Velum**: 6.5 oz, 1-3 days before planting
- **Salibro**: 1 lb ai, 1-3 days before planting
- **Vydate**: 2Qt+1, At planting + 20 days
- **Majestene**: 2 gal/A + 1, At planting + 21 days
- **Melocon**: 4 lbs/A x 2, At planting + 28 days
- **UTC**:

Bacterial toxins, *Burkholderia* spp, strain A396

Nematode parasitic fungus, *Paecilomyces lilacinus*
Root gall ratings on tomato (0-10)
Root gall ratings on tomato (0-10)

![Bar chart showing gall index ratings for different tomato varieties and dates: UTC, Nimitz, Vydate, Salibro, Velum, Melon, Majestene. The dates are 17.5.08, 17.5.31, and 17.6.27.]
Tomato Fruit Yield - 3 picks
Root gall ratings on tomato (0-10)

- 17.5.08: Gall index 0-10
- 17.5.31: Gall index 0-10
- 17.6.27: Gall index 0-10

Legend:
- none
- PicClor 60
- Pic100
Tomato Fruit Yield - 3 picks

![Bar chart showing tomato fruit yield for Pic100, PicClor60, and None treatments across 3 picks.](chart.png)
Plant vigor (NDVI) during the season

NDVI (0-1)

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8

17.04.10 17.04.20 17.05.01 17.05.15

Pic100  PicClor60  None

Greenseeker
Conclusions

- New 3-F Nematicides are less toxic and safer to use – no more danger label
- More selective – true nematicides – less impact on non-parasitic nematode feeding groups
- New modes of action – or unknown
- Different soil behavior – efficacy and application
- Not replacements for soil fumigants
- Biological nematicides are under further investigations this upcoming tomato season.
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