What I Will Talk About?

Minimizing Crop Impacts Using Vertical Management Zones for Nematode Control

Joseph W. Noling, Gary Vallad, Nathan Boyd
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What I Will Talk About?

- Traffic Pans
  - Gas / Nematode Movement

New Deep Placement Fumigant Application Systems

Vertical Management Zones

- ZONE 1
- ZONE 2

New Findings/Crop Responses to Zonal Treatments

Minimizing Crop Impacts Using Vertical Management Zones for Nematode Control
J.W. Noling, Gary Vallad, Nathan Boyd.

The Probinator: A New Deep Soil Coring and Exploration Tool

Traffic Pans

Subsurface Drip

Deep Shank
What has the Probinator told us about nematodes & fumigant gases?

**BED**
- 8"
- 12"
- 16"
- 20"
- 24"
- 28"
- 32"
- 36"
- 40"
- 44"

"variable"

Row middle - furrow

Traffic Pan

**BELOW**
- 8"
- 12"
- 16"
- 20"
- 24"
- 28"
- 32"
- 36"
- 40"
- 44"

**SOIL AIR FUMIGANT CONCENTRATION**

**SPATIAL DISTRIBUTION**

Visualizing need for new fumigant strategies

*Impact of the Soil Compaction Layer - Traffic Pan on Fumigant Movement & Nematode Control*

*Restricted Fumigant Penetration of deeper soil*
Where do nematodes come from when damage is expressed in the plant after fumigating?

**Untreated Bed**

**The Established Dogma**

**The Reality**

**Zone 1**

**10”**

**Surface bedded Soil**

**Subsurface Soil**

**Traffic Pan**

**Traffic Pan**

**Zone 2**

**A**

**The Sun, Wind & Heat, combine to kill majority of nematodes in surface soil. Immigrants from below amplify problem.**

**B**

**We have always thought that we did not kill all of them in the bed, and it was the survivors which we did not kill that infected the plant and caused the reappearance of the problem**

**C**

**The Sun, Wind, Heat, & Fumigant - All combined to Kill Bedded Nematodes. Reinfection comes From below the pan!**
The Probinator has allowed us to question the need for:

**Structuring Soil Pest & Disease Control**

**As a Composite of Vertical Management Zones**

Illustrating the Relative Impact of a Compacted Traffic Pan layer on Surface and Deep Drip Applied 1,3-D and Soil Air Concentration of 1,3-D with Soil Depth in the Plant Bed with an Underlying Impermeable Layer

**ZONE 1**

Surface Drip or Bed Shank

+ **ZONE 2**

Deep Drip or Deep Shank
Place the Telone below the traffic pan where nematodes reside, and shortly before where the raised bed will be placed.
Triest Rig - Summer broadcast rig – 15 inch injection depth

Telone II (12-18 gpta)

New Strategies for Nematode Management...

SOIL SEALING

Summer BROADCAST APPLICATION
Subsurfacing Drip Fumigation for Nematode Control
At the end of the season we counted plants into sizes

PLANT SIZE DISTRIBUTIONS enumerated for All Fields and Chemical Treatments by Row and Sprinkler Section

40 – 50 feet row

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Small: Canopy Diameter < 8” Relative Yield 17%
Medium: Canopy Diameter < 12” Relative Yield 48%
Large: Canopy Diameter > 12” Relative Yield 100%

RELATIVE YIELD computed as the sum contribution from all plant of different sizes within each sprinkler section

and Dead = 0 %
What might you expect from a deep placement fumigant?
Subsurface Deep Drip - Favorite Farms
Spring 2016

9% Increase in Yield
Do we need any treatments other than In-Bed and Deep Shank fumigants to manage Sting Nematode?

**Untreated Control**  
**Only Deep Shank Telone (18gpta)**

**In-Bed Telone C35 + Deep Shank Telone (18gpta)**

*Florida Strawberry Growers Association Research Farm (FSGA) - March 10, 2016*
The Deep Shank Treatment in this FSGA 2016 Field Trial contributed the Lions Share to Strawberry Yield Response

Untreated Control
 Only Deep Shank Telone (18gpta)
 In-Bed Telone C35 + Deep Shank Telone (18gpta)

Florida Strawberry Growers Research & Education Foundation
Dover, FL  Spring 2016

P < 0.0000
Untreated Control  Deep Shank Only  Deep Shank + In Bed C35

44% Yield Increase

Florida Strawberry Growers Association Research Farm (FSGA) - March 10, 2016
Summer Broadcast - Deep Shank

Deep Shank

Sprinkler Row
No Deep Shank

No Deep Shank

Thomas South Field - Spring 2016

Thomas Farm - Deep Shank - Untreated Areas
Walden Sheffied Farm, South Field, March 7, 2016

Relative Yield (0-1)

>25% Yield Increase

DOMINUS + DEEP SHANK TELONE II 18 GPTA
DOMINUS ALONE (Sprinkler Rows)

25% Increase in Yield
Deep Shank - Summer Broadcast
Thomas East Field WS - Spring 2016

Thomas Farm - Deep Shank - Untreated Areas
Walden Sheffied Rd, East Field, March 7, 2016

Relative Yield (0-1)

DOMINUS +
DEEP SHANK
TELONE II
18 GPTA

Deep Shank

DOMINUS ALONE
(Sprinkler Rows)

>29% Yield Increase

29% Increase in Yield
Deep Shank (In-Row) and Deep Drip
Florida Pacific Office Field - Spring 2016

"C:\DATA\MinTab\Florida Pacific Behind Office Plant Counts Spring 2016.MTW"
Florida Pacific- Deep Shank-Deep Drip- Grower Standard
Moores Lake Rd, Behind Office, March 7, 2016

P<0.0000
2% Yield Increase

Relative Yield (0-1)

<table>
<thead>
<tr>
<th>PIC CLOR 60 + DEEP SHANK TELONE II 18 GPTA</th>
<th>PIC CLOR 60</th>
<th>PIC CLOR 60 + DEEP DRIp TELONE II 18 GPTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Shank</td>
<td>Grower Std</td>
<td>Deep Drip</td>
</tr>
</tbody>
</table>

2% Increase in Yield
Is the clay lens in this field shallow?
Root Causes of Fumigant Inconsistency

- Every Field Contains a Traffic Pan, Depth of Deepest Tillage Implement
- Nematodes Distributed Deeply Throughout Entire Soil Profile
  - Nematodes not impeded by Traffic Pan
  - Fumigants (not MBr) greatly impeded by Traffic Pan
- Deeply placed fumigants are improving Nematicidical efficacy and Crop Yield Response
Strategy is Gaining Traction!

A new rig on old nematode land, Dover, FL
Thank you
Is it any wonder fumigant movement is upward and out, on the Path of Least Resistance!
How Many Nematodes do you think there are in surface soil when you ‘Bake and Turn’ the soil a few times over the summer?
How Many Nematodes do you think there are in surface soil when you ‘Bake and Turn’ a few times over the summer?

Cumulative Summary of Sting Nematode Incidence from soil survey of 5 farm locations and at 5 soil depths. (n=100) August 11, 2016

(Nematodes undetected in 50% of all preplant samples)

Soil Depth (inches)

- (0-8) 5%
- (8-16)
- (16-24)
- (24-32)
- (32-40)

Sting incidence (%)
Two dimensional Approaches to population assessment & crop loss & risk assessment

There is a 3\textsuperscript{rd} dimension requiring consideration!

In Reality: Nematodes distributed throughout soil profile while most sampling within surface strata (8-10”), vertically constrained by impenetrable traffic pan!

Do sample estimates represent entire population threat?

- Is it any wonder why Economic Thresholds are difficult to establish!
**Product Precautions & Disclaimers:**

"will suppress and/or control pests that are in the fumigated zone at the time of treatment"

**USE PRECAUTIONS**
Keep children and pets out of treated areas. **Product X** uses described on this label are intended for pre-plant soil preparation only. All plant foliage and any established plants growing on the treatment sites will be either severely damaged or destroyed. Keep the product off of any desirable turf or plants. Do not apply within 3 feet of the drip line of desirable plants, shrubs, or trees. Do not use in confined areas without adequate ventilation or when fumes may enter nearby dwellings. Do not use in greenhouses. Keep container tightly closed when not in use. Do not store near feed or food. **NOTE:** **Product X** will suppress and/or control only those pests in the fumigation zone at the time of treatment. Reinfestation may occur subsequent to the fumigants degradation/dissipation from the soil.

"Will help manage certain soil borne pests that are present in the soil treatment zone at the time of Fumigation"

**Use Precautions**
**Recontamination Prevention**
**Product Z** will help manage certain soil borne pests that are present in the soil treatment zone at time of fumigation. It will not control pests that are introduced into soil after fumigation. To avoid reinfestation of treated soil do not use irrigation water, transplants, seed pieces, or equipment that could carry soil borne pests from infested land. Avoid contamination from moving infested soil onto treated beds through cultivation, movement of soil from below the treated zone, dumping contaminated soil in treated fields and soil contamination from equipment or crop remains. Clean equipment carefully before entering treated fields. Cultural practices which provide post-harvest destruction of crop residues and weeds prior to fumigation and practices which prevent weed infestation following fumigation and prior to planting will help prevent recontamination.

**Avoid recontamination**
- irrigation water
- infested transplants
- propagative materials
- equipment
Southern Valley Crop Termination / Deep Shank / PIC study - Adel, GA - Austin Hamilton

1. Pic Clor 60 (11 gpa)  
2. Pic Clor 80 (8 gpa)  
3. Pic 100 (5.8 gpa)
End of Harvest Season - 1st crop Green Bell Pepper
Plant Mortality attributed to Phytophthora blight
Phytophthora capsici
End of Harvest Season - 1st crop Green Bell Pepper
Plant Mortality attributed to Phytophthora blight

_Phytophthora capsici_
STILL....

HUGE OBSTACLES to OVERCOME!