



Anaerobic Soil Disinfestation – can it help with Weed Control?

Exploiting Weed Vulnerabilities
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Strawberry farms evolving

Matted Row



Plasticulture, protected culture –
perennial and annual systems



“12 year effect”

Not New!



Distribution of 58 strawberry farms surveyed in Eastern NY

17 farms had disease as primary limiting problem

16 farms had weed pressure that limited production

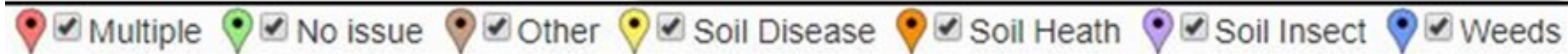
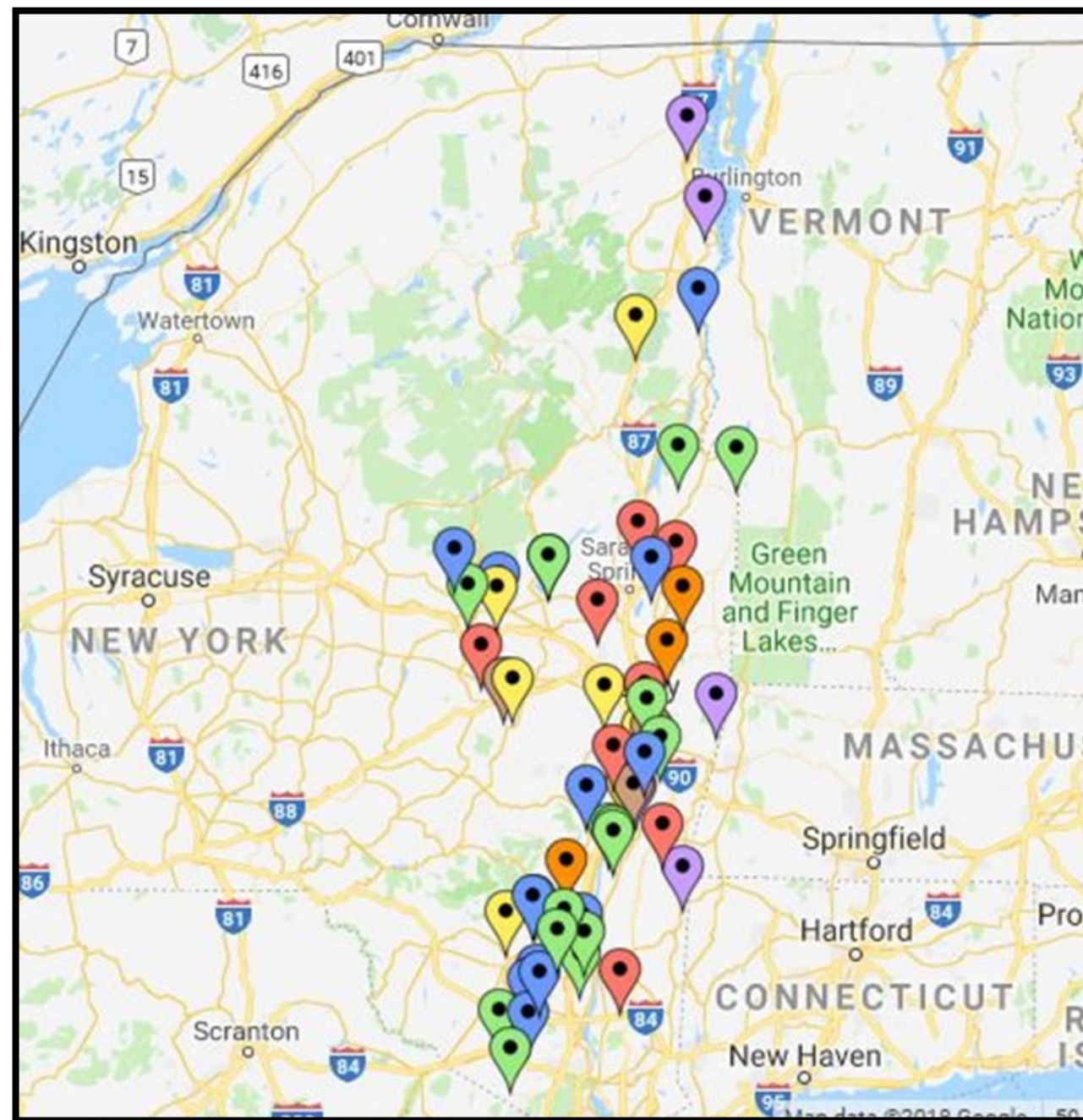
15 farms had abiotic damage

10 farms with overall soil health in 'poor' category

8 farms had limiting soil insect populations

4 farms had nematodes present

13 farms had no identifiable problems





Weed Pressure!



Flumioxazin



Glyphosate

Herbicide Injury

Photos courtesy of OMAFRA:
<http://www.omafra.gov.on.ca/IPM/english/strawberries/herbicide-injury/index.html>



S-metolachlor



Terbacil

Cornell soil health test results

Soil quality ranged from medium to excellent on Cornell Soil Health Tests

Common Issue Included:

- Aggregate stability
- Organic matter
- Soil respiration

Measured Soil Textural Class: **fine**

Sand: --% - Silt: --% - Clay: --%

Group	Indicator	Value	Rating	Constraints
physical	Surface Hardness	146	57	
physical	Subsurface Hardness	189	84	
physical	Aggregate Stability	10.0	9	Aeration, Infiltration, Rooting, Crusting, Sealing, Erosion, Runoff
biological	Organic Matter	2.5	5	Nutrient and Energy Storage, Ion Exchange, C Sequestration, Water Retention
biological	Soil Respiration	0.4	22	
chemical	Soil pH	5.8	42	
chemical	Extractable Phosphorus	5.3	100	
chemical	Extractable Potassium	131.0	100	
chemical	Minor Elements Mg: 121.2 / Fe: 6.4 / Mn: 13.6 / Zn: 0.8		100	

Overall Quality Score: **58** / Medium



Nematodes

Root lesion nematode,
Pratylenchus penetrans

Northern root knot
nematode, *Meloidogyne*
hapla





Sustainable, Effective Management Options

Crop Rotation
Cover Crops

Chemical fumigation

- Expensive and hard to find
- Scale limiting
- Incomplete control
- Customer push-back?



Biofumigation

- Timing issues
- Not a 'quick fix'
- Commitment to cover crops is necessary



Anaerobic Soil Disinfestation



- Showing great promise in warm soil regions and in high tunnels
- Expensive
- Little testing in cold regions

Hypothesis for northeast plasticulture and matted row JB strawberries:

- ASD will control
 - soil borne disease fungi
 - nematodes
 - weeds
- ASD will have no negative impact on soil health
- Carbon source will impact pest control.
- Cost vs. benefit of ASD should not discourage adoption





Methodology

- 4 Farms
 - 2 matted row - conventional
 - 1 plasticulture – conventional
 - 1 plasticulture, high tunnel - organic
- 3 carbon types
 - Alfalfa Meal (9 T/a)
 - Brassica Seed Meal (4.5 T/a)
 - Dried Molasses (9 T/a)
- Three varieties – Jewel, Cavendish, Galletta
- Additional treatments
 - Biofumigation – ‘Caliente’ Mustard
 - Chemical fumigant
 - Fungicide – Mefanoxam
- 3 years of plant and soil data
- 2 years of yield data



Apply carbon



Incorporat



Wet soil to field capacity



Tarp for 2-3 weeks



Sustained soil temps of 68-85° F





Tarp removed – gas off for several days

Measurements

- Soil Health – 1x/year
- Plant vigor – 3x/year
- Yield – 2 years
- Fruit Quality – 2 years
- Weed infestation – 2x/year
- Plant health – 1x/year



ASD **may be** more effective in suppressing weeds than tarping under aerobic conditions because:

- soil saturation enhances the decomposition of organic matter
- anaerobic conditions foster the accumulation of toxic volatile fatty acids and other organic acids in amended soil*
- lack of oxygen suppresses weed seed respiration
- anaerobic conditions result in changes in soil temperature and pH, which work synergistically with other factors to kill weed propagules.

* Greenwood 1961

Questions?

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