Can improvement of Soil Health lead to Disease Suppression?

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Biofumigation

- The use of glucosinolate (GL)-derived isothiocyanate (ITC) from brassica cover crops to suppress soil-borne pests and pathogens (Kirkegaard et al., 1993)
Biofumigation by MTBP
(Macerated, Till, cover with Black Plastic)

Seeding: 10 lb/acre

5 weeks

Flail mower

Till

Cover with plastic (1 week)
Suppression of root-knot nematodes by MTBP-Biofumigation

- Higher soil sulfate concentration one week after MTBP indicated higher efficacy of biofumigation of glucosinolate compounds compared to bareground (BG), no-till (NT), macerated no-till (MNT), no-till with black plastic (NTBP), till (T), and (macerated till).
- Efficacy of MTBP was observed on population of root-knot nematodes in the soil after a zucchini crops following the mustard treatment.
Solvita Test

<table>
<thead>
<tr>
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<th>CO² (kg/ha)</th>
<th>Solvita color code (0-5 scale)</th>
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<tbody>
<tr>
<td>BG</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>MT</td>
<td>AB</td>
<td>AB</td>
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<td>MTBP</td>
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<td>MTS</td>
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The image shows bar graphs comparing CO² (kg/ha) and Solvita color codes across different samples (BG, MT, MTBP, MTS). The results indicate varying levels of CO² and Solvita color codes, with some samples showing higher CO² and darker Solvita color codes compared to others.
Biofumigation with brown mustard (M) or brown mustard plus water (MW) increased soil microbial activities as indicated by higher CO₂ burst. Thus, biofumigation increased soil microbial activities.

But biofumigation did not reduce Fusarium wilt disease incidence on lettuce.
Biofumigation with brown mustard (M) was more efficient in performing biofumigation than MW.

Biofumigation with brown mustard + water (MW) achieved better green manure effect in Trial II ($\theta = 30\%$) than in Trial I ($\theta = 37\%$).

Soil sulfate concentration was negatively related to Fusarium wilt incidence in Trial I, and positively related to number of lettuce plants that survived in Trial II.

**Lettuce Yield**

**Sulfate as an indicator of biofumigation (7 days after initiation of biofumigation)**

**Trial I**
- C = Bareground control
- M = Mustard
- MW = Mustard + Water

**Trial II**
- C = Bareground control
- M = Mustard
- MW = Mustard + Water
Soil Drenching of Solution from Organic Materials against Banana Fusarium Wilt

Treatments: (5 gal water / plant)

- A = Actinovate (*Steptomyces lydicus*),
- L = Lobster meal,
- M = Mustard (ground),
- Sb = Subtilex (*Bacillus subtilis*),
- Sh = Shrimp shell meal,
- V = Vermicompost tea,
- W = Water

Lobster meal suppressed Foc, mustard meal increased soil microbial activities.

Purple colonies were Fusarium colonies.

Banana root samples on Komada selective medium

Mustard (ground)
Soil Drenching of Solution from Organic Materials on plant-parasitic nematodes and soil health (8 weeks after treatment)

- Mustard resulted in lowest abundance of reniform nematodes.
- Lobster and mustard increased bacterivorous and fungivorous nematodes, vermicompost tea increase % omnivorous nematodes.
- Lobster enhanced bacteria decomposition, mustard enhanced fungal decomposition.
Nematode Suppression
Biofumigation by macerating mustard residues (17 lb FW/plant) followed by drenching H₂O to achieve 30% gravimetric soil moisture (we use 5 gal/plant).

Foc Suppression
Lobster meal mix into water at 35 lb/1000 ft² soil (here we mix 0.32 lb with 5 gal water per plant). Lobster meal contains chitin, thus enhance beneficial soil chitin-feeding microbes, that can dissolve cell wall of pathogenic fungi.

Soil Health
Brew uncured vermicompost tea >12 hours at 1:100 water, delivered 5 gal/plant.