Use of Oyster Mushroom Compost for Nematode Management

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Introduction

The oyster mushroom (*Pleurotus ostreatus*) is known to have nematicidal effects on plant-parasitic nematodes *in vitro*. This species produces a toxin, trans-2-decenedioic acid, which paralyzes nematodes allowing the fungi to colonize the body, and consume the nitrogen from nematodes. Currently, information is lacking on making use of the nematicidal properties of oyster mushroom against plant-parasitic nematodes in the field. Root-knot nematodes (*Meloidogyne sp.*) are plant pests that cause billions of dollars of crop loss annually worldwide. Basil (*Ocimum basilicum*), a profitable crop, generating revenue of up to $9.5 million in Hawaii in 2011 was selected as the study crop here as it is highly susceptible to root-knot nematodes (Fig.1). Laboratory results showed that 1% (w/w) oyster mushroom compost suppressed 87.5% root-knot nematodes, whereas 25% (w/w) mushroom compost water extract (MCWE) suppressed 28% nematode viability.

Two basil field trials were conducted with amending potting mix with 50% oyster mushroom compost, and drenching the roots with 25% MCWE after transplant into the field (Fig.2). Objectives of these experiments were to examine if mushroom compost treatments 1) suppressed plant-parasitic nematodes; 2) enhanced beneficial nematodes (bacterivores, fungivores, omnivores) and 3) improved basil yield.

Fig. 1. Root galls on basil

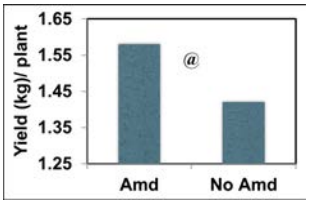
Materials and Methods

Trial I Treatments

Mushroom Amendment

Cover Crop

Buckwheat incorporated into the soil after 4 weeks vs bare ground



Trial II Treatments

Basil seedlings prepared in 50 % (w/w) mushroom amended potting media vs no amendment

Yard waste compost mulch

Mulch applied as a top dressing at the time of planting

Brewing MCWE

MCWE Drench

MCWE 25% (w/w) drenched every 8 weeks vs no drench

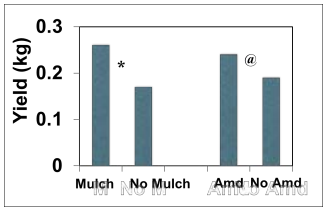


Fig. 2. Materials and Methods Diagram showing treatments for Trials I and II

Results & Discussion

Trial I: Although mushroom compost amendment and MCWE drench did not suppress root-knot nematodes, they improved bacteria decomposition (increased abundance of bacterivorous nematodes) and fungal decomposition (increased abundance of fungivorous nematodes) when integrated with buckwheat cover cropping. Planting a cover crop also helped to maintain the soil food web structure in mushroom compost treated soil. Mushroom amendment ($P < 0.10$) increased basil yield by 10.5%.

Trial II: Similarly, mushroom compost treatments did not suppress plant-parasitic nematodes but did improve soil food web structure (as indicated by structure index). In addition, mushroom amendment increased nematode richness (number of genera) and abundance of omnivorous nematodes (an indication of a healthier soil food web) when integrated with yard waste compost mulching. Overall basil yield was improved 20% by adding mushroom compost amendment to the seedlings ($P < 0.10$).

Summary

- ✓ Mushroom amendment improved basil yield in both trials, but MCWE drench did not, possibly due to low drenching frequency.
- ✓ Mushroom amendment and drench did not suppress plant-parasitic nematodes in both trials.
- ✓ In Trial I, mushroom amendment only enriched the soil food web (more bacteria and fungal decomposition). In Trial II, where soil was shallowly tilled, mushroom amendment improved soil food web structure.
- ✓ Recycled mushroom compost waste would have greater benefits for organic farms or farms that integrate cover cropping to improve soil and plant health.

Acknowledgement

This project is supported by a Western Region SARE grant (project number GW14-007).
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