

Assessing Biopesticides for Oyster Mushroom (*Pleurotus ostreatus*) Production

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Introduction

Oyster mushrooms, *Pleurotus ostreatus*, are the second most cultivated mushroom after the *Agaricus* white button mushroom. It is extremely nutritious and in high demand in gourmet cooking due to its flavor. The most destructive pest of this crop is the mushroom fungus gnat in the genus *Lycoriella* spp. It can cause damage through larval directly feeding on mushroom mycelium and through the adult spreading pest mold spores throughout a growing site.

At present, there is little research in managing pests in the oyster mushroom farms while most of the research has been on button mushroom cultivation. Pesticide applications can damage the mushroom yield. Furthermore, due to the gourmet nature of oyster mushrooms, there is little tolerance by the public for mushrooms grown in a conventional manner. This leave organic farming practices and biopesticides.

Biopesticides such as entomopathogenic nematodes and *Bacillus thuringiensis israelensis* (*Bti*) have shown promise in control of fungus gnats in various settings. These have not yet been tested in oyster mushrooms.

Objective

To determine if the biopesticides nematodes and *Bti* show insecticidal activity towards fungus gnats when applied to oyster mushroom substrate.

Methods

- Blue oyster mushroom cultures were maintained and propagated on sterilized rye berries and kept in in breathable polypropylene bags at 21°C.
- Pre-cut straw was soaked for 2 hours then pasteurized in water heated to 60-70 ° C for 1 hour.
- 30 bioassay containers (950 ml) were prepared by drilling two 0.75 cm holes into the sides and covering those with a fine mesh to prevent fungus gnat escape.
- Pasteurized straw was placed into these bioassay containers and inoculated with 100 ml of colonized rye berries through mixing thoroughly.
- Bioassay containers were held overnight at 21°C.
- Using a pipette in a laminar flow hood, 30 ml of *Bti*, nematode or deionized water (control) formulations was mixed with inoculated straw.

Methods Continued

- 10 gravid females were deposited in each container and held at 21°C.
- At 21 days after treatment (DAT), yellow sticky cards were glued to the tops of the bioassay containers.
- At 25 DAT, sticky cards were removed, and adult fungus gnats counted.
- A one-way analysis of variance (ANOVA) was used to assess interactions between treatments and means were separated using the Tukey's HSD test.
- A log transformation was used to normalize data.

Hypothesis

We hypothesize that nematodes and *Bti* treatments will produce significantly fewer fungus gnats than the control.

Results

No significant differences were found between the control and the nematode treatments (Fig. 1). The *Bti* treatment produced significantly fewer fungus gnats than the control (Fig. 1). Further, visually fewer fungus gnats emerged from the *Bti* treatment than the nematode treatment, although not significantly different (Fig. 1).

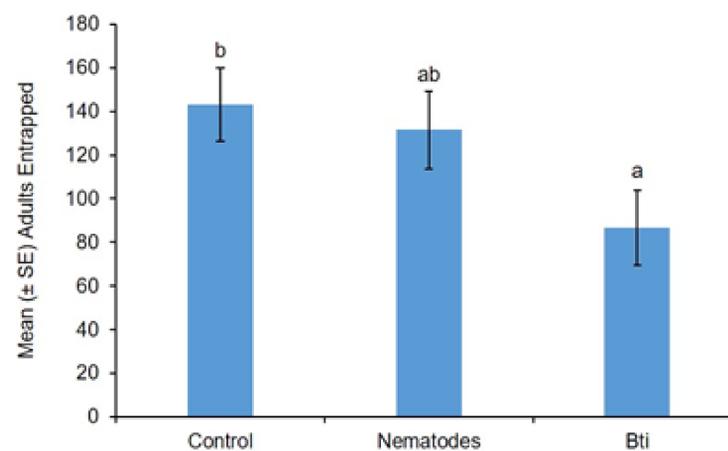


Fig 1. Mean (±SE) number of adult fungus gnats which emerged from oyster mushroom substrate treated with either distilled water (Control), nematodes, or *Bacillus thuringiensis israelensis* (*Bti*). Means with different letters are significantly different from statistical analysis using a one-way ANOVA and Tukey's HSD test.

Discussion

Based on these results, the *Bti* treatment significantly effected fungus gnat survival. This is consistent with previous research in the button mushroom system. Due to these findings, *Bti* may be an effective option for oyster mushroom farmers to use as a control method other than pesticide applications.

However, we did not find the entomopathogenic nematodes to be an effective form of control for this pest. This is contrary to previous button mushroom research. This could be due to mortality of the nematodes upon first administration to the substrate. Another potential reason for the low efficacy is that oyster mushrooms have been reported to be nematophagous. Further research is needed to assess biopesticide efficacy and determine the cause of the high fungus gnat emergence when entomopathogenic nematodes are used for control.

Integrated pest management is important for farmers to use to produce higher yields. Biopesticides are one of the tools that can be used in integrated pest management systems. Further research is needed to optimize biopesticide applications on oyster mushroom farms.

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