

Beneficial Fungi Survey of BC Agricultural Soils

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Introduction

The purpose of this survey is to isolate pathogens from insects and soil samples with the intention of developing native biological control products for common pests. Biological controls are natural predators or diseases that are capable of killing insect pests and plant diseases, and are used in both agriculture and landscapes. Biological controls are an important part of Integrated Pest Management, which reduces the use of conventional chemical treatments. Fungi and other entomopathogenic organisms found in the insects and soil samples will be isolated and evaluated for their potential development into commercially available biological control products.

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Objectives

- To collect soil samples from different environments of the Lower Mainland, Vancouver Island, and the Okanagan Valley and insects from soil and greenhouses in the Lower Mainland.
- To isolate and purify target entomopathogenic microorganisms from the collected soil and insect samples.
- To use molecular identification tools to identify entomopathogenic microorganisms to the species level.
- To evaluate the efficacy of isolated entomopathogens.
- To evaluate production methods for bio-pesticide products for any isolated entomopathogens of interest.

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Materials and Methods

Soil samples were collected from conventional and organic farms, parks, forests, and golf courses. Insects were collected from greenhouse and field vegetable crop sites.

Soil samples were processed by mixing 10 grams of soil per sample in 0.2% Tween 80 to suspend all particles, fungi, bacteria and viruses prior to culturing them on artificial selective media.

100 µl of solution was spread over the surface of artificial media in petri dishes and incubated at 18°C for 1-2 weeks. The media used for this study contains crystal violet, which deters saprophytic organisms from outgrowing targeted entomopathogenic fungi.

Soil samples were also directly 'baited' using *Galleria mellonella* (wax moth) larvae, which are very susceptible to a wide range of entomopathogens.

Suspect entomopathogenic fungi were re-isolated on Potato Dextrose Agar amended with Streptomycin to inhibit bacterial growth, and identified morphologically to the Genus level using a compound microscope, and to the species level using molecular tools (Polymerase Chain Reaction and DNA sequencing).

Fungi belonging to Entomopathogenic Genera are then tested for pathogenicity using *Galleria mellonella*.

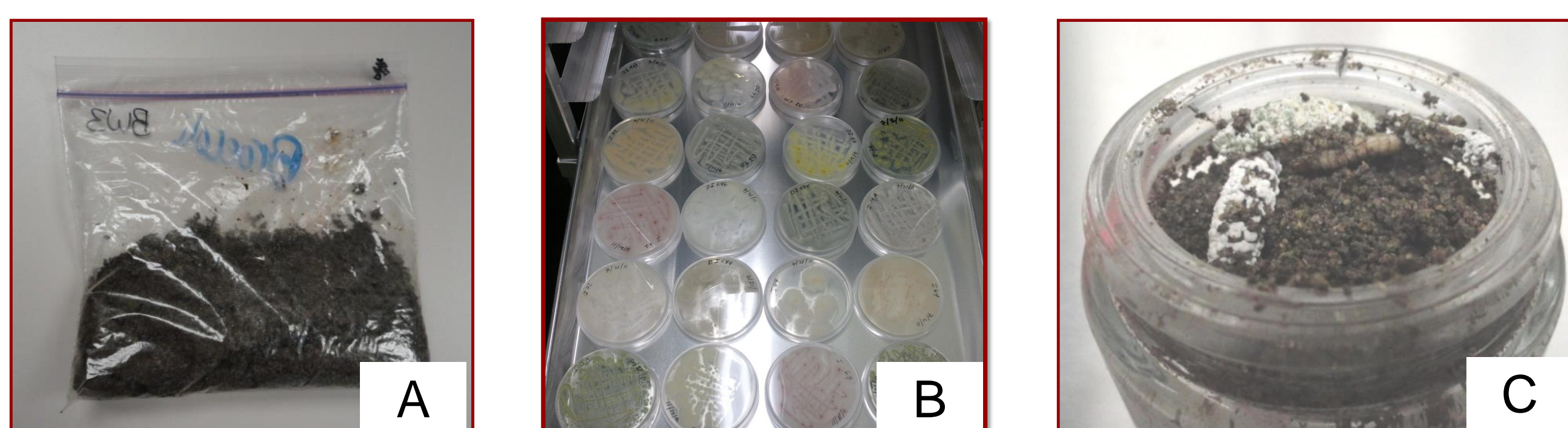


Figure 1. (A) soil sample (B) petri dishes with fungal growth (C) infected galleria larva in soil sample

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Results

The following species of beneficial fungi were isolated during the survey:

1. *Trichoderma* spp. – Natural control for plant diseases
(these isolates are being tested for their efficacy to control plant diseases, particularly *Phytophthora infestans* – the causal agent of potato late blight)
>98 isolates
2. *Beauveria* spp. – Natural control for insects
>5 isolates
3. *Metarhizium* spp. - Natural control for insects
>13 isolates
4. *Lecanicillium* spp. - Natural control for insects
>3 isolates
5. *Paecilomyces* spp. - Natural control for insects
>22 isolates
6. *Verticillium* spp. - Natural control for insects

Many of the isolates were from the genus *Zygomycota* (i.e. *Mucor*, *Rhizopus* or *Zygorhynchus*) or genus *Mortierellales*, which are common soil saprophytes.

Another large group was *Penicillium* and *Cladosporium*, which are common saprophytes on decaying organic matter in soil or weak pathogens/invaders of dying/decaying leaves.

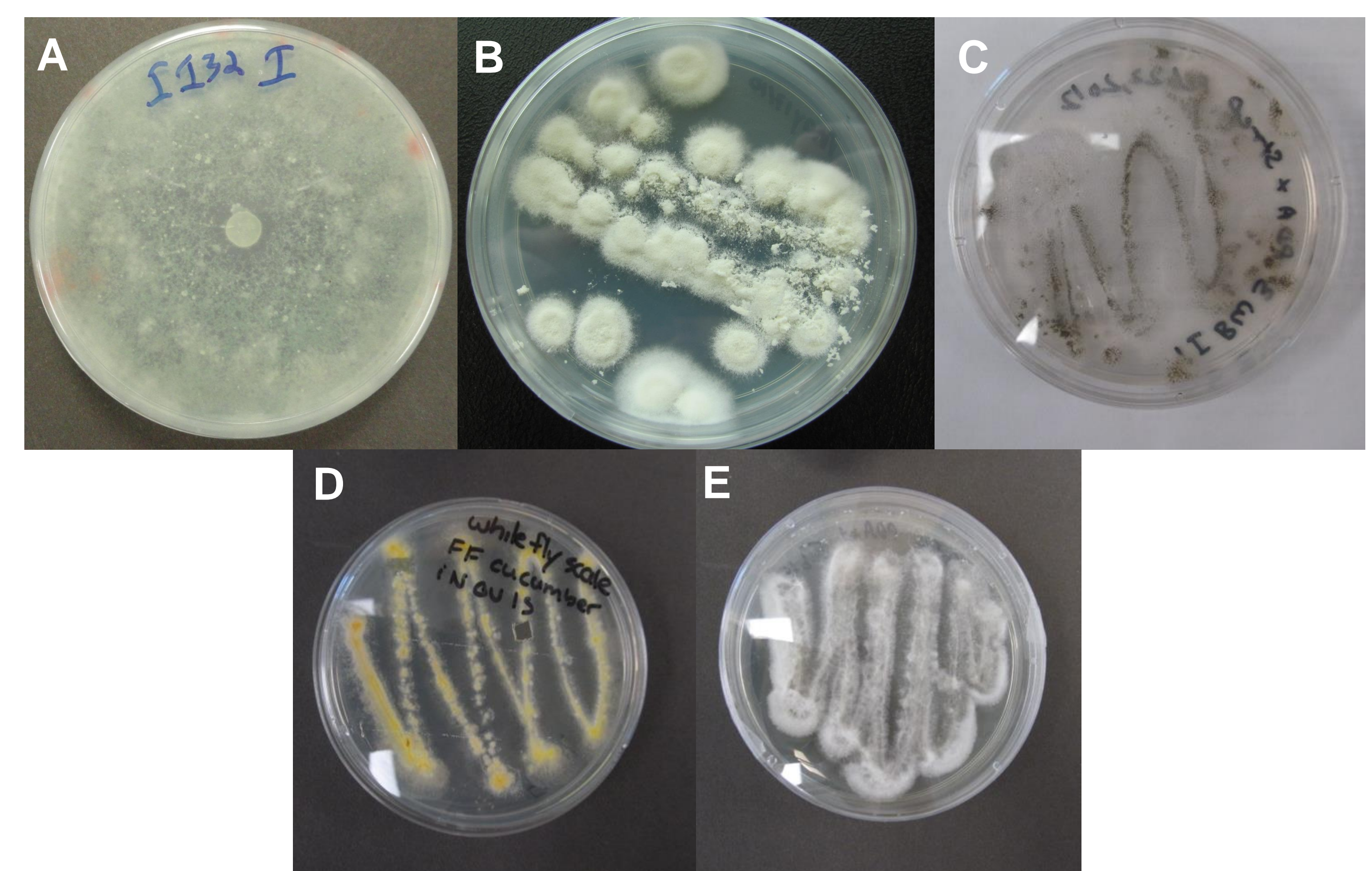


Figure 4. Petri dishes with beneficial microorganisms. *Trichoderma* sp. (A), *Beauveria* sp. (B), *Metarhizium* sp. (C), *Paecilomyces* sp. (D), and *Verticillium* sp. (E).



Figure 3. Insects collected during survey showing symptoms of fungal infection.