Laboratory efficacy of mycoparasitic fungi (Aspergillus tubingensis and Trichoderma harzianum) against tropical bed bugs (Cimex hemipterus) (Hemiptera: Cimicidae)

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ABSTRACT

Objective: To test the effectiveness of conidial spore formulations [Aspergillus tubingensis (A. tubingensis) and Trichoderma harzianum (T. harzianum)] against tropical bed bugs, Cimex hemipterus.

Methods: Spore formulations were made from two fungal strains, T. harzianum and A. tubingensis. The bed bugs were exposed to the conidial spores placed soaked onto a fabric cloth for 1 h and the mortality counts were recorded daily until 14 days.

Results: Mean survival times based on Kaplan–Meier survival analysis showed no significant differences between all the concentrations in both the fungal isolates: T. harzianum and A. tubingensis. However, the evaluation of both the isolates in terms of virulence resulted in low lethal hours in all the concentrations except for the high concentration of A. tubingensis (LT₅₀ = 44.629 h) at the conidial exposure of 1 × 10⁶ spores/mL. Rapid mortality of the bed bugs was observed from Day 6 to Day 12, ranging from 13% to 90% in all three concentrations of A. tubingensis. With reference to the T. harzianum exposure, the concentration of 1 × 10⁴ spores/mL displayed a gradual increase in the percentage mortality of 90 on Day 14.

Conclusions: Approaches to the bed bugs treatment should be explored in-depth using a natural biological agent like fungus especially A. tubingensis to reduce this pest population, in order to replace chemical methods.

1. Introduction

The rise of entomopathogenic fungi studies as pest control has implied that recent studies have shown promising improvements in the fungi’s effectiveness as biological control agents. The potentials of Metarhizium anisopliae (M. anisopliae) and Beauvaria bassiana (B. bassiana) isolates in reducing the survival of major pests and disease vectors have been proven [1–4]. Despite their wide geographical distributions, both of these fungal strains are also capable of infecting a broad range of insect hosts compared to other fungal isolates that are mostly targeted species [5,6]. The combination of the two fungal species also yielded successful treatment in controlling weevils (Cylas formicarius) that tend to attack tuber crops in the field, as shown in the study by Reddy et al. [4].

Aside from the above major pathogens against insect, other fungal isolates are also currently developed and studied for their uses as promising biological control agents. These include Trichoderma sp. which is known for their pathogenic activities against plant diseases but may act on insect vectors like...