

ENTOMOPATHOGENIC FUNGI AS A POTENTIAL BIOCONTROL STRATEGY FOR CLOVER ROOT BORER MANAGEMENT

Anis S. Lestari and Sujaya Rao

Oregon State University

Department of Crop and Soil Science, 3017 ALS, Corvallis, OR 97331

anislestari1@gmail.com, sujaya@oregonstate.edu

Entomopathogenic fungi offer great potential as biological control agents for soil dwelling pests. They produce spores that can effectively infect pests developing below ground that are a challenge to control with insecticides. One such subterranean pest is the Clover Root Borer (CRB) which damages red clover plants when raised for seed, and prevents the crop from being raised beyond two years thus causing economic hardship to growers. In the past, CRB was effectively controlled by application of organochlorine insecticides. Due to their persistence and non-target negative impacts, this group of insecticides was banned in the 1970's and currently, no insecticide is labeled for this pest. Meanwhile, naturally occurring insect pathogens (entomopathogens) have had an opportunity to build their populations over the years and may be suppressing CRB populations. However, there is no information about the association of CRB with naturally occurring entomopathogenic fungi and their virulence. Hence, the objectives of this study were to: 1) Determine the naturally occurring entomopathogenic fungi of CRB; 2) Assess the virulence of entomopathogenic fungi against CRB.

Naturally occurring entomopathogenic fungi of CRB: Soil samples were collected from fields growing red clover for seed production in the Willamette Valley. CRB were collected from the soil samples and pathogens observed growing on dead CRB were isolated and plated on appropriate media. In addition, soil baiting with wax moths was used for isolating pathogens from soil samples. Two species of entomopathogenic fungi, *Beauveria bassiana* (Fig. 1) and *Isaria fumosorosea* (previously known as *Paecilomyces fumosoroseus*), were isolated from the fields. Two strains were isolated for each fungal species (Table 1). Thus, in all, 4 isolates of entomopathogenic fungi were collected from red clover seed fields in western Oregon.

Virulence of entomopathogenic fungi against CRB: Four strains of entomopathogenic fungi collected from the field and 2 commercial products, *Metarhizium anisopliae* and *Isaria fumosorosea*, were evaluated for their virulences against CRB. Ten adult beetles per petri dish were dipped in fungal spore solutions (10^8 spores/ml). The trial was conducted as a randomized block design with six replicates. The number of infected CRB was recorded daily for two weeks. All 6 strains of entomopathogenic fungi caused more than 70% mortality of CRB adults (Fig. 2).

The results of the study suggest that two naturally occurring entomopathogenic fungi, *B. bassiana* and *I. fumosorosea*, are present in red clover seed production fields in western Oregon. The absence of pesticide applications may have facilitated growth and development of these entomopathogenic fungi, and more species and strains may be present. Additionally, the study documented that field-isolated entomopathogenic fungi had similar levels of virulence compared to commercial products. Thus, *Beauveria bassiana*, *Isaria fumosorosea* and *Metarhizium anisopliae* have potential as biological control agents for CRB. Further research is needed to evaluate the efficacy of these fungi in suppressing CRB populations in fields in western Oregon.



Fig. 1. CRB adult infected by naturally occurring *B. bassiana*.

Table 1 Naturally occurring entomopathogenic fungi collected from clover seed production fields in the Willamette Valley in 2014.

Isolate No.	Isolate Source	Species of entomopathogenic fungus	Total number of isolates
1.	Soil	<i>Beauveria bassiana</i> A	4
2.	Dead CRB and Soil	<i>Beauveria bassiana</i> B	6
3.	Soil	<i>Isaria fumosorosea</i> A	2
4.	Soil	<i>Isaria fumosorosea</i> B	1

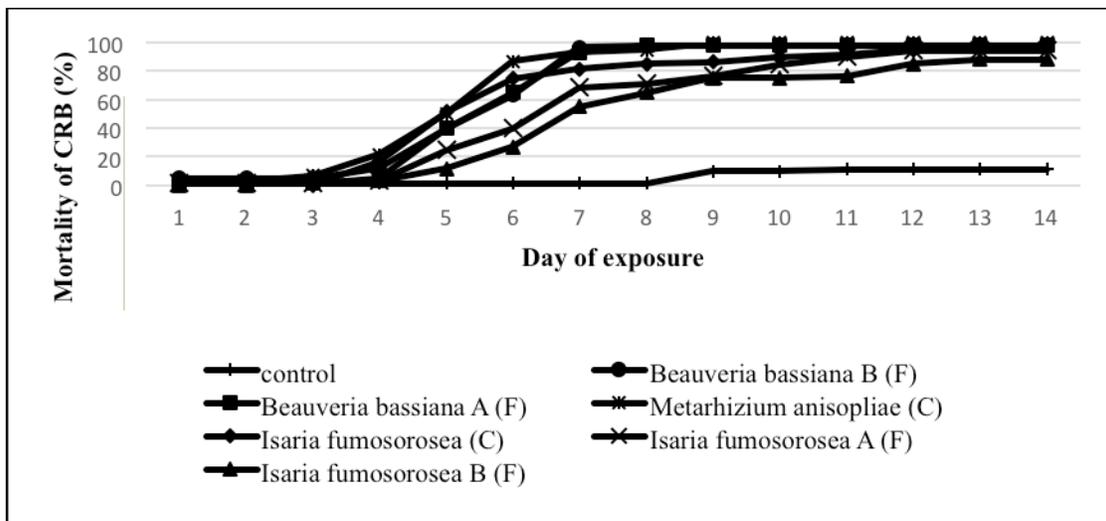


Fig. 2. The virulence of entomopathogenic fungi against CRB. Mortality (%) of adult CRB exposed to spores of field-isolated and commercial strains. (C) = Commercial product; (F) = Field collected.