

## An Insect Pathogen as a Biocontrol Agent against a Subterranean Pest

### Sustainable Agriculture Fact Sheet

September 2017

**Crop:** Red clover

**Need:** Develop an effective control for the clover root borer

**States:** Oregon, Washington

**Background:** Red clover is a legume used as a cover crop and in forage mixes, and its seed is produced commercially in western Oregon and Washington. One of its major pests is the clover root borer, which was accidentally introduced to the United States more than 100 years ago. A species of bark beetle, the clover root borer is unique in that it develops underground in the roots of red clover instead of under the bark of trees like other bark beetles.

**The Problem:** There are currently no effective ways to manage the clover root borer. Several decades ago, growers used organochlorine insecticides like DDT, which, because of their long persistence in the soil, effectively controlled the insect. After they were taken off the market because of the environmental harm they caused, growers eventually saw a return of the root borers, which they can only manage by rotating fields every two years to get away from the pest.

**The Research:** Western SARE provides fund to Oregon State University graduate student Anis Lestari to study whether insect pathogens, in particular naturally occurring fungi, had potential as biocontrol agents for controlling the clover root borer. Over two years, she collected soil samples enveloping red clover roots from five commercial seed production fields in the Willamette Valley. Dead clover root borers caused by pathogens were also collected from the soil samples. Pathogens growing on dead adults and from soil samples were isolated and identified. Lestari isolated four types of fungi found on dead beetles, and tested those pathogens, as well as commercially available products, on live adults.

**The Impact:** Based on those laboratory studies, Lestari found that entomopathogenic fungi have the potential for use as a biological control agent for clover root borers in red clover seed fields in western Oregon. One species, *Metarhizium brunneum*, showed the greatest potential as a biological control agent as it was the second most dominant naturally-occurring fungus recorded from red clover fields, killed 100% of clover root borers in the virulence test, and successfully established a colony, sporulated in the soil, and infected more than 80% clover root borer adults in the bioassay with field collected soil.

**The Challenges Ahead:** Entomopathogenic fungi are used successfully as biocontrol agents in some crops, but their effectiveness depends on climate, soil, the particular pest and a number of factors. This promising preliminary research needs to be field tested and validated before recommendations can be made to growers.

#### Links:

Overview: <http://www.westernsare.org/Learning-Center/From-the-Field/Graduate-Student-Program-From-the-Field/Managing-A-Challenging-Subterranean-Clover-Pest-Sustainable-Control-Using-Insect-Pathogens>

Project report: <https://projects.sare.org/project-reports/gw15-018/>

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