A Solution Takes Root

Fungal Control for Root-Eating Insects

Root-eating insects could soon be eating themselves sick—if their favorite food has been treated with a fungal control agent.

Nurseries in the Pacific Northwest struggle to control the black vine weevil and other root-eating insects. Biological control agents are expensive and largely ineffective against their larvae. But, entomopathogenic fungi—that is, fungi that cause diseases in insects—have proved more successful.

Current control methods involve applying large amounts of entomopathogenic fungi to the soil in which at-risk plants grow. This approach is expensive and inefficient. ARS entomologist Denny Bruck has discovered that using plant roots as a "delivery system" for these fungi is cheaper and more effective than broad distribution.

He and his ARS colleagues in the Horticultural Crops Research Unit at Corvallis, Oregon, tested several fungal isolates, or individual strains, and found that some of them thrived in the rhizosphere, the area surrounding a plant's roots. In fact, some fungal populations were 10 times denser in the rhizosphere than in the surrounding bulk soil.

In one study, Bruck and his colleagues mixed potting media with the spores of *Metarhizium anisopliae*—a fungus that occurs naturally in fields. They observed that some *M. anisopliae* isolates colonized the rhizosphere of the container-grown plants and grew well there.

The scientists showed that it was possible to keep isolates alive and thriving in a natural environment, but could the fungi help reduce root-eater populations?

"Sometimes a fungal isolate kills insects really well in the lab, but it's not equipped to survive in a field environment," Bruck says. "The reverse is also true: Just because an isolate thrives in the field doesn't mean it's a successful biological control agent."

Bruck and his colleagues applied *M. anisopliae* directly to plant roots by dipping them into a solution containing fungal spores. Black vine weevil larvae died after eating the fungus-treated roots, proving that the method is effective.

Dipping roots in entomopathogenic fungal solutions may also prove to be economical and efficient, because growers need to treat only that specific area. And it works: In one study, about 80 percent of the insects were infected after feeding on the fungus-treated roots.

What's more, another study demonstrated that black vine weevil larvae actually *prefer* the colonized plant roots, meaning that they are more likely to snack on the roots that will harm them. Bruck is currently developing a cooperative research and development agreement with a biotechnology company in Virginia to turn this fatal attraction into a treatment for nursery and greenhouse plants.

"Weevils are a huge pest of nursery crops on the west coast," Bruck says. "If we could mitigate that threat, we'd have the ability to save millions of dollars every year."—By **Laura McGinnis,** ARS.

This research is part of Crop Protection and Quarantine, an ARS national program (#304) described on the World Wide Web at www.nps.ars.usda.gov.

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DENNY BRUCK (D844-1)

Black vine weevil.