

Kaolin Particle Film Knocks Out Citrus' Evil Weevil

Decades ago, a seemingly innocuous shipment of nursery plants from Puerto Rico destined for Florida's lush, subtropical gardens contained a broad-nosed weevil—*Diaprepes abbreviatus*. Since then, that pest's appetite for the roots and leaves of citrus trees has made it one of the most damaging insects in the state of Florida.

ARS scientists, led by entomologist Stephen L. Lapointe of the U.S. Horticultural Research Laboratory in Fort Pierce, Florida, have found a way to counter this pest. They use kaolin particles not only to keep *D. abbreviatus* from feeding on treated foliage, but also to dramatically reduce the number of eggs it deposits on leaves. The commercial kaolin formulation they use was developed by soil scientist Michael Glenn and entomologist Gary J. Puterka, with ARS' Appalachian Fruit Research Station in Kearneysville, West Virginia.

The weevil was first detected in Apopka, Florida, in 1964. In the 37 years since, *D. abbreviatus* has spread through 19 counties, infesting more than 150,000 acres and endangering the state's \$8.5 billion citrus industry. In

the Caribbean, this pest exacts an estimated \$75 to \$100 million worth of crop losses every year.

Several characteristics make the hardy *D. abbreviatus* particularly difficult to control. Both immature and adult stages are polyphagous, meaning they feed on many different plants, including sugarcane. Adults live for about 4 months, and females each produce several thousand eggs. Larvae are hard to detect because they drop from leaves onto the soil surrounding the tree, where they burrow in and feed on the roots. A relatively few larvae can kill a mature tree by chewing around, or girdling, its structural roots. Their feeding also provides infection sites through which disease-causing microorganisms can enter. So it is the *Diaprepes* larvae that inflict most of the damage.

"In addition, citrus rootstocks have a very low degree of genetic diversity," says Lapointe. "Florida soils are also highly permeable, making groundwater contamination with pesticides a major limitation to chemical control. We really need new alternatives to control this pest. Kaolin may be one such alternative for citrus growers."

PEGGY GREB (K9305-1)



Young (left) and older larvae of the *Diaprepes* root weevil on cakes of an artificial diet developed by ARS.

KEITH WELLER (K7456-1)

Adult *Diaprepes* root weevil.



Kaolin is a soft, white, clay mineral that, when combined with water, can be sprayed on citrus or other trees to form a protective particle film. This film prevents the eggs of *Diaprepes* root weevils from sticking to the leaf.

Each female can produce up to 5,000 eggs. She creates a kind of egg sandwich, nestling her eggs gently between two leaves. If the eggs fail to stick to the leaf, they fall to the ground and dry up or are eaten. In preliminary tests, kaolin film completely suppressed the de-

positing of eggs.

Kaolin also seems to prevent the weevil from feeding on citrus leaves. Puterka thinks that the particle film could be keeping the weevil from sensing—through its antennae or legs—the physical or chemical cues it uses to identify host plants. Adult weevil feeding was reduced 68 to 84 percent on treated foliage.

"These results indicate a potential for kaolin as a barrier to the weevil's egg-laying in citrus groves," says Lapointe. "It may prove to be an economically viable and environmentally sound component of an integrated approach to control *D. abbreviatus* and related root weevils."—By **Jesús García**, ARS.

This research is part of Crop Protection and Quarantine, an ARS National Program (#304) described on the World Wide Web at <http://www.nps.ars.usda.gov>.

PEGGY GREB (K9302-1)



PEGGY GREB (K9304-1)



The citrus leaf on the left was sprayed with a kaolin-based particle film as a deterrent to *Diaprepes* root weevils.

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At the U.S. Horticultural Research Laboratory farm in Fort Pierce, Florida, technician Anna Sara Hill and entomologist Steve Lapointe examine an orange tree sprayed with a kaolin film.