

# Biology Of The *Ferrisia gilli* Mealybug: Potential For Biological Controls

**KENT M. DAANE**, UCCE Associate Specialist,  
UC, Berkeley;

**DAVID R. HAVILAND**, UCCE Entomology Farm Advisor,  
Kern County;

**GLENN Y. YOKOTA**, Staff Research Associate,  
UC, Berkeley at Kearney Agricultural Center;

**WALT J. BENTLEY**, Extension Entomologist,  
UC IPM Program at Kearney Agricultural Center;

**KRIS GODFREY**, Entomologist,  
California Department of Food and Agriculture

## INTRODUCTION

During the past few years, a new insect pest has increased in importance in California pistachio and almond orchards – a mealybug named *Ferrisia gilli*. Mealybugs damage crops by direct feeding, vectoring plant pathogens, and secreting honeydew that promotes the growth of sooty molds, which contaminate the fruit or nuts. A recent taxonomic description of *Ferrisia gilli* as a “newly named insect” was combined with a field study of its biology on Central Valley pistachios. When this mealybug was initially found infesting pistachios (and other crops), it was thought to be the more common “striped” mealybug (*F. virgata*) or a close relative (*F. malvastrae*). However, differences in adult morphology and its biological importance prompted Penny Gullan (Department of Entomology, UC, Davis) to complete morphological and molecular studies that led to the new name, *F. gilli* (after Ray Gill at CDFA), hereafter referred to as the “gilli” mealybug.

The pistachio industry needs immediate control solutions. Insecticides are the first option and David Haviland has investigated insecticide controls and crop damage. As stated in last year’s proposals, “Insecticides will be found that can provide immediate relief. For example, in collaboration with Walt Bentley (area wide Entomologist), we have developed insecticide programs for the vine mealybug. It is likely that some of the same materials will work well against the gilli mealybug – insect growth regulators (e.g., Centaur™) are good contact insecticides that may work best...” From Haviland’s studies, this has certainly shown to be true and this readily available control tool will potentially reduce gilli mealybug damage.

While guidelines for insecticide use are developed, the pistachio, grape and almond industries are exploring the option of biological controls. Because the gilli mealybug may be native to the United States, the “importation” and release of any natural enemies in California will be bureaucratically easier. In 2005, we began the

investigation of a biological control program for the gilli mealybug, focusing on parasitoid species rather than predators, as parasitoids most commonly provide effective mealybug control.

## RESULTS

We surveyed pistachio and almond sites infested with the gilli mealybug. At all but one almond site, the mealybug populations were depleted by early summer, either by effective insecticide applications or by natural enemies. We did not rear any parasitoids out of the pistachio orchards sampled (all received insecticides for either bugs, worms or both). At the one untreated almond site only a few trees were infested with the gilli mealybug. In that almond block, circumstantial evidence of “mummified” mealybug skins – left after a parasitoid has emerged – suggested there was a very high level of parasitism throughout the summer period. Five parasitoid species were reared. These are the *Pseudaphycus* sp. nr. *meritorius*, *Chrysoplastycerus* sp. nr. *splendens*, *Anagyrus pseudococci*, *Allotropia* sp., and a “hyperparasitoid” (*Chartocerus* sp.). Of these, the *Pseudaphycus* was the most common, and was most responsible for the dramatic reduction of the gilli mealybug in the almond orchard sampled.

We also conducted a literature search to determine if other parasitoid species might be available for importation. Because the gilli mealybug is a newly described species, there are no references to natural enemies attacking this mealybug. However, the closely related striped mealybug is a worldwide pest and there are more than 40 described parasitoids listed. The literature suggests that worldwide efforts against the striped mealybug have used a number of common and relatively polyphagous (attacking a number of different mealybug species) natural enemies, such as *Leptomastix dactylopii* and *Anagyrus pseudococci*. There are also more specific parasitoids (*Aenasius advena* and *Blepyrus insularis*) that should be considered for future importation.

Work on the mealybug biology was initially delayed because the gilli mealybug is not officially a resident in Fresno County. We now have set up a colony of the gilli mealybug at the UC, Berkeley quarantine, and have established colonies of *Pseudaphycus* sp. nr. *meritorius*, *Anagyrus pseudococci*, *Leptomastix dactylopii*, and *Leptomastidea abnormis* (either on the gilli mealybug or the vine mealybug). Studies of the biology of *Anagyrus pseudococci* have been conducted, using the vine mealybug as a host. Results show that this species prefers to attack the older, larger mealybug stages and that the overwintering biology of *A. pseudococci* will lower its effectiveness.

against the mealybug, but will provide some level of control if being used for other pests, such as soft scale or navel orangeworm.

5. Documentation that mealybugs can cause significant reductions in the value of the pistachio crop will lead to the development of treatment thresholds for this pest. These thresholds, however, must be documented at multiple sites over multiple seasons to ensure their accuracy. As far as this year is concerned, a density of three mealybugs per cluster in June was sufficient to cause a 15% reduction in the grower paid weight per acre. This was mostly due to a decrease in the percentage of total edible split inshell nuts.

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