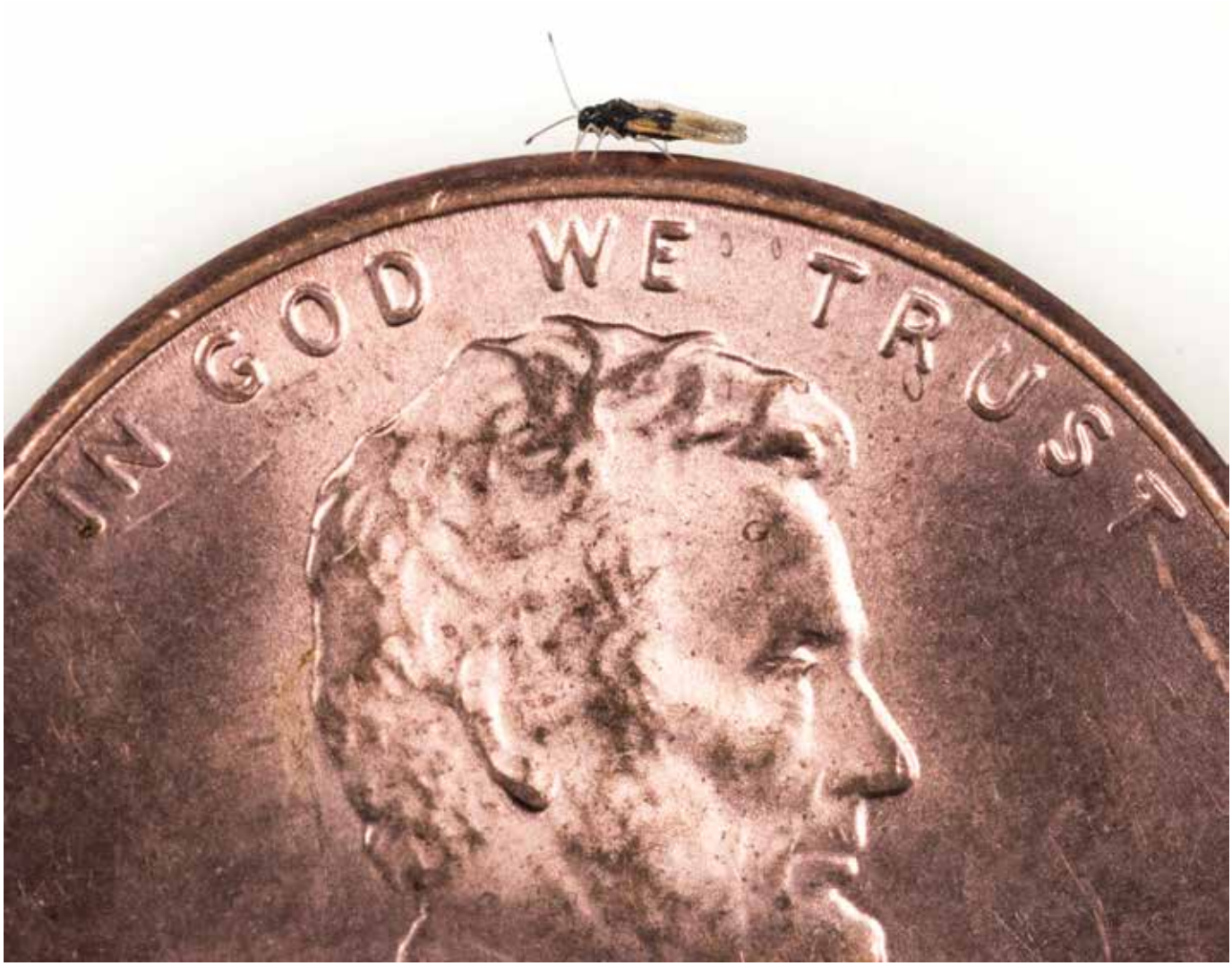

Figure 1. An adult avocado lace bug shown on a penny for scale. Photo credit: Mike Lewis, UC Riverside.

Avocado Lace Bug Update

By Tim Spann, PhD
Spann Ag Research & Consulting

The avocado lace bug (ALB; *Pseudacysta perseae*) was first described in 1908 from specimens collected in Florida and was originally believed to be native to Florida. In Florida, the Caribbean and eastern Mexico, damage from ALB can be quite severe. So naturally, when ALB was first discovered on backyard avocado trees – primarily Bacon or Bacon-like cultivars – near Chula Vista and National City in southern San Diego County in 2004 there was concern that similar damage would occur in California. That didn't happen – that is until recently.

A Jekyll and Hyde Pest

In 2004, the California Avocado Commission funded Dr. Mark Hoddle to conduct foreign exploration in ALB's presumed native range (Florida, the Caribbean and eastern Mexico) with the goals of determining where the population in California came from through DNA analysis and to determine if egg parasitoids could be found for potential use in a biological control program. Through direct collecting and samples being provided by other researchers, ALB specimens were examined from Florida, the Caribbean, throughout

Mexico, Central America, Texas and South America.

Results of these DNA analyses determined that the ALB population in California had most likely originated from the state of Nayarit on Mexico's west coast, not from Florida or the Caribbean. This DNA work also revealed that ALB likely was not native to Florida, the Caribbean and eastern Mexico as presumed, but also was invasive in these areas. It is most likely native to western Mexico where ALB population genetic diversity is high. Additionally, no specialist natural enemies or egg parasitoids were found, dashing hopes for a biological control program.

In 2017, the ALB situation in California changed dramatically. After more than a decade of hanging out in backyards in southern San Diego County, ALB started to appear in commercial Hass avocado groves in northern San Diego County and Riverside County. By 2019, the pest was found on backyard trees in Los Angeles County, and Hawaii also was invaded. In 2022 and 2023, infestations were found in commercial groves in Orange and Santa Barbara counties, respectively. So, what changed with ALB?

CAC once again turned to Mark Hoddle who went back to the DNA. Samples of ALB from the newly infested commercial groves did *not* match the population that had existed in southern San Diego County since 2004. Rather, these new infestations matched populations in Florida and the Caribbean. These two populations, the original one from western Mexico and the new one from Florida/Caribbean, are dramatically different in their behavior, with the latter being much more aggressive in its propensity for infesting Hass avocados.

Avocado Lace Bug Biology

ALB adults and nymphs have specialized piercing-sucking mouth parts that allow them to extract sap from the underside of avocado leaves. This feeding results in necrotic islands — chlorotic areas that turn into brown, dead lesions — on the upper leaf surface. Heavy feeding damage can result in leaf loss that may lead to sunburn damage to fruit.

Adult ALB are about 2mm (<0.1in) long with blackish-brown bodies covered by yellowish wings and appearing quite flat. Their life cycle is between 21 and 42 days from egg to adult, depending on temperature, and there are four instars (developmental stages) before adulthood. Nymphs (immature stages) are ovoid, reddish-brown to black, with spines around the edges. Eggs are often laid in loose rows and are covered in tar-like fecal matter to protect the eggs from desiccation.

Paloma Dadlani, an M.S. student in Mark Hoddle's lab who was partially funded by CAC, conducted detailed temperature studies on ALB development and survivorship. These studies were conducted in temperature cabinets that were programmed to simulate six fluctuating temperature profiles that averaged 15, 20, 25, 30, 32 and 35°C (i.e., 59, 68, 77, 86, 90 and 95°F) over a 24-hour period. These cycles were developed based on historical weather data to represent various ALB-infested areas of southern California.

Data from these studies indicate that the optimal temperature range for reproduction and instar development is 25-32°C (77-90°F). The minimum temperature for ALB development is about 9-10°C (48-50°F). The upper lethal temperature range is 34-39°C (93-102°F). This is supported by field observations of ALB where the pest appears more problematic in coastal areas (e.g., Oceanside and Carpinteria) than inland areas (e.g., Bonsall). Inland areas experience higher summer temperatures that may cause populations to crash due to heat stress.

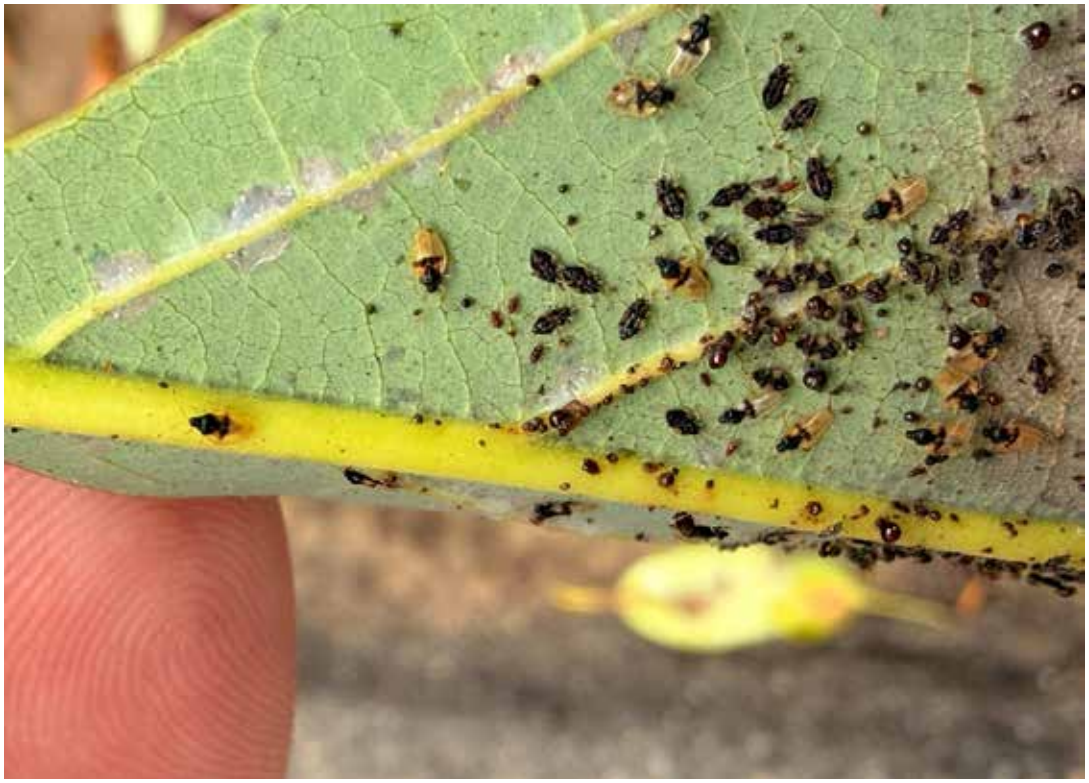

Figure 2. An avocado leaf showing adult, juvenile avocado lace bugs and eggs.

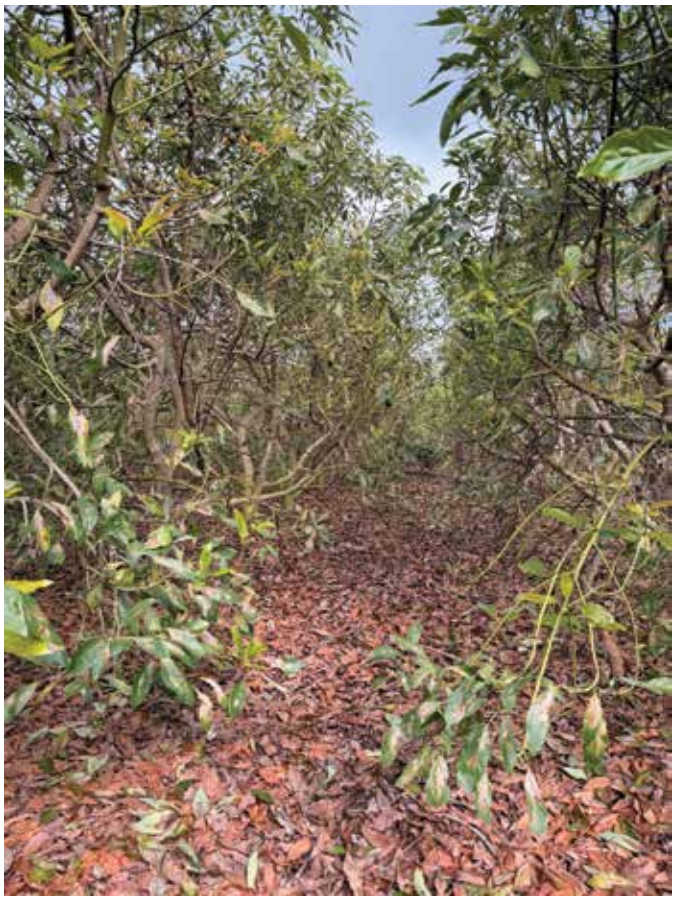

Figure 3. Large-scale defoliation caused by an extreme infestation of avocado lace bug in a grove in Carpinteria, Santa Barbara County.

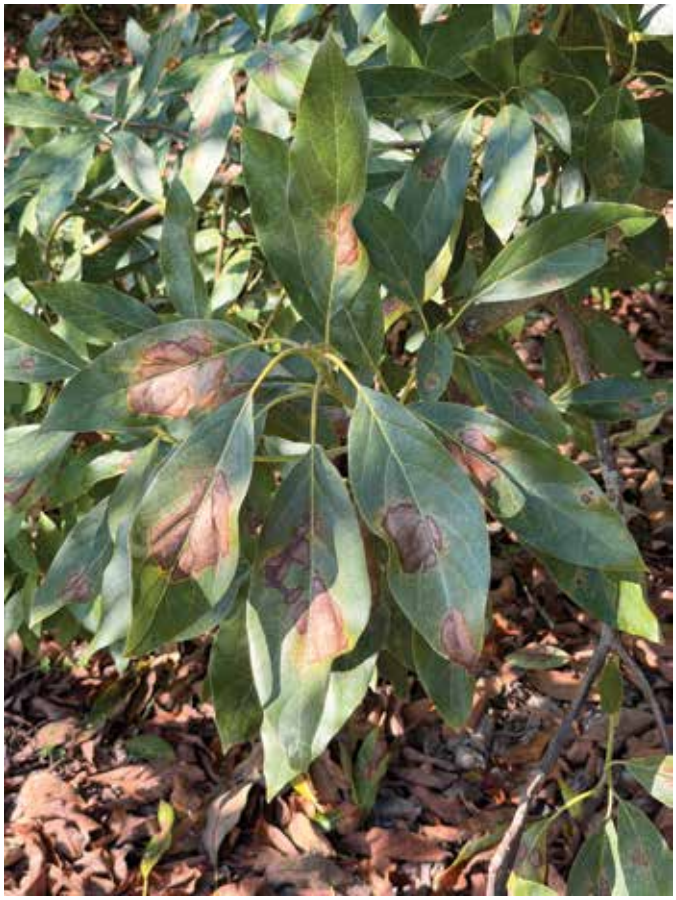

Figure 4. Avocado leaves showing the classic necrotic islands symptoms of avocado lace bug feeding damage.

Table 1. Pesticides currently registered for use in California on avocados for the control of lace bugs.

Active Ingredient	Example Product[1]	IRAC Class[2]	Organic	Comments[3]
Imidacloprid	Admire	4A	No	Chemigation only effective on young trees; apply foliarly on mature trees
Piperonyl butoxide, Pyrethrins	Evergreen EC 60-6	3A	No	
Permethrin	Pounce 25WP	3	No	
Azadirachtin, Pyrethrins	Azera	UN/3A	Yes	
Beauvaria bassiana	BotaniGuard	UNF	Yes	Works best in humid climates; unlikely to be effective in California
Zetacypermethrin	Mustang	3A	No	
Fenpropathrin	Danitol	3	No	Broad-spectrum, very disruptive to beneficials; probably best used in winter
Geraniol, peppermint oil, cotton seed oil, rosemary oil	Furious	N/A	Yes	
Zetacypermethrin/ Avermectin	Gladiator	3/6	No	
Pyrethrins	Pyganic	3A	Yes	Broad-spectrum, likely to disrupt beneficials

[1]Trade names are given only as examples of products that contain the listed active ingredient(s) and do not represent recommendations for specific products.

[2]The Insecticide Resistance Action Committee classifies pesticides based on their mode of action to aid in insecticide resistance management. Repeated applications of insecticides from the same class leads to resistance.

[3]The comments provided are based on grower and/or pest control advisor experiences that have been shared with the author.

Avocado Lace Bug Management

As with all invasive pests, management practices lag behind pest spread and we are learning a lot from pest control advisors and growers who are actively trying to manage ALB. Several insecticides are currently registered for use on avocados against avocado lace bug (Table 1). Unfortunately, most of these pesticides are from the same class, making resistance management difficult (see "Pesticide Resistance Issues Facing California Avocado", Fall 2025 *From the Grove* for more information on resistance management).

Imidacloprid (Admire®) has not performed well on mature trees when applied as a soil drench but may work well on younger trees (4-5 years old at most). Foliar sprays on mature trees have resulted in moderate control. The label rate for imidacloprid on avocados is 10.5 – 14 fluid ounces/acre, with 14 fluid ounces being the maximum amount allowed per year. Thus, if trying imidacloprid for ALB control, it's advisable to use the 14 fluid ounce rate for maximum efficacy.

Fenpropathrin (Danitol®) is effective at controlling ALB but is very disruptive to natural enemies and other beneficial insects. For this reason, fenpropathrin may be best suited for use during the winter to minimize impacts on beneficials.

Spirotetramat (Movento®) is not specifically labeled for use against lace bug on avocado. However, California Department of Food and Agriculture rules allow PCAs to write recommendations for use of products against non-labeled pests if the product is registered for use on the crop. Spirotetramat has provided good control of ALB. Given that spirotetramat is in a different insecticide class than most of the other available products, and it can be applied two to three times per year depending on the application rate, it is likely a good option to use in rotation with other insecticides.

Organic options are more limited and may be less effective at controlling ALB. Products containing *Beauvaria bassiana*, an insect-killing fungus, are likely to be ineffective since these products generally do best in high humidity climates. Azadirachtin has not produced very good results to date. Pyrethrins (Pyganic®) are likely to be effective but, like fenpropathrin, can be disruptive to biological control. Some horticultural oils are available for use under organic certification but often can only be used when other control measures have failed. Kaolin clay products (Surround®) are effective at smothering ALB, but growers should talk with their handlers before using them to be sure packing houses have brushes on their packing lines to adequately remove the material during the packing process. Growers should always check with their organic certifier before using any product to make sure its use will not jeopardize their certification.

Since ALB lives on the underside of leaves, they are difficult to control even with the most efficacious insecticides. Coverage is extremely important and is likely best achieved with high spray volumes applied from the ground. It is unlikely aerial applications of any product will prove effective at controlling ALB especially if canopies are tall and interlaced. To this end, canopy management is going to be critical for managing ALB. Infestations and damage in high density plantings or hedge rows are often much more severe than in more traditional spacings. Growers should prune their trees to allow good spray penetration.

In situations where severe infestation has occurred and leaf loss is significant, extra nitrogen applications may be warranted to push new growth to replace lost leaves.

Table 2. Insecticides currently registered for use in California on avocado but not specifically labeled for control of lace bugs, and pesticides not currently registered for use in California on avocado but may be useful in the lace bug management.

Active Ingredient	Example Product[1]	IRAC Class[2]	Organic	Comments
Registered for use on avocado				
Flupyradifurone	Sivanto Prime	4D	No	Registrant supports adding lace bug to the label with E/CS[3] data
Spirotetramat	Movento	23	No	Registrant supports adding lace bug to the label with E/CS data
Fenazaquin	Magister SC	21A	No	Registrant supports adding lace bug to the label with E/CS data
Spinosad	Entrust	5	Yes	Registrant will consider supporting registration after reviewing preliminary efficacy data
Chlorantraniliprole	Altacor	28	No	Registrant supports adding lace bug to the label with E/CS data
Not currently registered for use on avocados				
Flonicamid	Beleaf 50 SG	29	No	Registrant supports adding avocado and lace bug to the label if efficacy data support its use
Afidopyropen	Sefina Inscalis	9D	No	Entering IR-4 trials in 2026; if successful, a registration package will be submitted to EPA in 2-3 years
Isocycloseram	Plinazolin	30	No	Registrant is supportive of adding avocado and lace bug to the label, but this chemical has many downsides that may make registration in California difficult (see article text for more details)

[1]Trade names are given only as examples of products that contain the listed active ingredient(s) and do not represent recommendations for specific products.

[2]The Insecticide Resistance Action Committee classifies pesticides based on their mode of action to aid in insecticide resistance management. Repeated applications of insecticides from the same class leads to resistance.

[3]Efficacy and crop safety data

What's On the Horizon?

Developing effective management tools for ALB was a high priority topic for CAC's Production Research Committee. To fulfill this priority, CAC worked with staff at the IR-4 Project to begin the process of getting more insecticide products registered for use against ALB. The IR-4 Project (Interregional project 4) is a federally funded program designed to help specialty crop industries address pest management concerns since the crop protection industry typically focuses their efforts on major crops (corn, soybean, cotton), leaving specialty crops (fruits and vegetables, ornamental crops) with fewer tools to effectively manage pests. IR-4 is a competitive program and specialty crop industries must submit proposals that are reviewed and ranked regionally and then nationally. If proposals are accepted into the program, IR-4 will coordinate and pay for the necessary trials to get a new insecticide registered.

In 2025, CAC submitted proposals for eight different insecticides as well as a proposal for an integrated solutions (IS) project. IS projects screen multiple insecticides for efficacy against a specific target pest and then move effective products into the registration pipeline. Typically, only two or three IS projects are selected annually and the ones selected in 2025 have all been put on hold due to funding shortfalls.

Discussions with the IR-4 entomologists led to the selection of the eight products submitted (Table 2). Of these, five products are already registered for use on avocados in California, but not specifically for ALB. The manufacturers of all of these, except spinosad, support adding ALB to the label if efficacy and crop safety data are provided to them. The manufacturer of spinosad will not support the addition of ALB to the label until they review preliminary efficacy data. CAC's PRC will discuss the best way to generate this efficacy data.

The remaining three products are not registered for use on avocados. Of these unregistered products, afidopyropen (Sefina Inscalis®) was selected to move forward into the IR-4 program. Afidopyropen is the first product in a new insecticide class (9A) and is derived from a compound produced by *Penicillium coprobium*. We were, in part, successful in getting this product into the IR-4 program because its use on avocados to control ALB was also supported by Florida, Puerto Rico, and Hawaii. Trial work will begin in 2026, and, if everything goes smoothly, a registration packet will be submitted to EPA in 2-3 years. At that time, CAC will ask the manufacturer to request a concurrent review by the California Department of Pesticide Regulation.

Flunicamid (Beleaf 50 SG) is another unregistered product. The manufacturer is supportive of completing the necessary work to register this product if efficacy data show that it is effective against ALB.

The final product, isocycloseram, is a brand-new chemistry that is being brought to market by Syngenta. Syngenta has indicated it is supportive of adding avocado and ALB to the label if preliminary efficacy data can be provided. However, this product belongs to the class of chemicals commonly known as PFAS — forever chemicals. That makes it questionable whether it could ever receive CDPR approval. Additionally, it is a broad-spectrum insecticide so it would be harmful to beneficials, will have a bee restriction, aerial applications will be prohibited (except for corn, cotton, soybean and potato), and a spray drift buffer will be required for all applications.

The PRC will continue to discuss ALB and how CAC's limited resources can best be used to address this critical issue. In the meantime, growers should work closely with their PCAs to monitor ALB populations and take proactive corrective measures before populations get out of control.