

# AVO Research

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## Agri-Mek Section 18 Approved for the 2004 Field Season

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### SECTION 18 APPROVED FOR 2004

For the sixth year, abamectin (Agri-Mek 0.15 EC) has been approved for use against avocado thrips in California, under a Section 18 Crisis Exemption (posted 28 Feb. on the California Department of Pesticide Regulation Website as Section 18 #04-03, <http://www.cdpr.ca.gov/docs/sec18/pdf/04-03.html>). The 2004 Section 18 allows use



Adult avocado thrips on the underside of an avocado leaf.

of abamectin by air only and only a single treatment may be applied per season. Growers should contact their County Agricultural Commissioner's office about restrictions on the size and nature of buffer zones around treated areas as well as for other conditions of use or requirements, including vegetative filter strips.

Because only a single Agri-Mek application is allowed this season, growers and pest control advisors should carefully choose between avocado thrips control alternatives. Decisions should be based on avocado thrips levels in each particular grove, the availability of application equipment (in years with warm weather and high avocado thrips levels in a number of groves, the spray queue for helicopter use can be as long as 10-14 days), the potential for thrips resistance to develop, and the relative costs and benefits of using Agri-Mek as opposed to other avocado thrips control options.

### AVOCADO THRIPS CONTROL OPTIONS

In addition to using Agri-Mek by air, Success (or Entrust, its organically approved analog), or Veratran D can be used for avocado thrips control either by air or by ground. Remember, ground sprays are generally preferred if feasible because better coverage is usually obtained with ground versus aerial treatments.

Field experience with the use of Agri-Mek, Success, and Veratran D has shown that control varies with material, levels of thrips present, spray coverage, and weather during and following treatment (especially weather with Veratran D). Details are provided below for each of the three major options for avocado thrips chemical control (please read and



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follow the pesticide label; in particular note label restrictions on the use of Success and Agri-Mek during bloom when bees are foraging). Materials are listed from least to most persistent control of avocado thrips.

1. *Veratran D + sugar or molasses* – The liquid in the spray tank should be acidified to pH 4.5 prior to adding Veratran D to the tank. Acidification helps to maximize treatment efficacy. Veratran D residues are not persistent on leaves and are reduced to approximately 50% of the initial level 4 days after treatment (Hare and Morse 1997), resulting in perhaps 1-3 weeks of control depending on weather, application method, and thrips levels (because it is a bait, rain will tend to wash off the material and the application will be less effective; Veratran D works best in warm weather because thrips feeding activity increases when it is warm). To avoid plugging of spray lines, screen size should be 20-

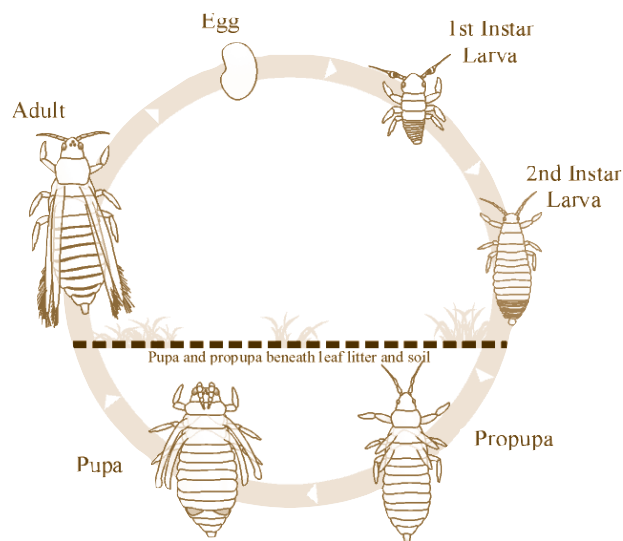
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mesh or larger, and because this material must be consumed by the thrips to be effective (it is a stomach poison with minimal contact activity), it is wise to withhold additives from a Veratran D treatment unless experience has shown that efficacy is not compromised. Because Veratran D is a stomach poison, it is mostly innocuous to natural enemies (i.e., it is the most selective of the three materials).

2. *Success 2 SC + Narrow Range 415 Spray Oil or Entrust 80% + an organically approved oil* – Success and Entrust have the same active ingredient (spinosad) but Entrust is formulated to meet standards set for organic use (cost is somewhat higher with Entrust so Success would normally be used otherwise). Success is in the macrocyclic lactone class of chemistry and shows translaminar activity (it moves into the upper cell

Entrust into leaves or fruit and should be added to the spray tank at a rate of 0.25-1%. Do not use acidifying buffering agents in tank-mixes with Success. Success is relatively innocuous to natural enemies (e.g., results in a slight and temporary reduction in predaceous mites and thrips) and treatments normally hold for 2-4 weeks.

3. *Agri-Mek 0.15 EC + Narrow Range 415 Spray Oil* – Agri-Mek is also a macrocyclic lactone, exhibits translaminar activity, and should be used with oil. Thrips poisoned by Agri-Mek take 3-5 days to die; thus, control can be somewhat slower than with faster-acting insecticides. This material is quite persistent in leaves and treatments can hold for 6-10 weeks or more. Agri-Mek is also fairly innocuous to natural enemies (slightly greater impact than Success but still a very selective chemical because residues on leaf surfaces are very low within a day after treatment).



**Avocado Thrips' Lifecycle.**  
Note that the second instar larva is a bright yellow and is responsible for most damage.

damage fruit 1.5-2 inches or more in diameter), the grower's tolerance for damage, the potential for pest resistance to develop, and the costs and benefits of each control option (Yee et. al. 2001). Because such decision-making is fairly complicated and is improved with experience, we suggest that growers consider hiring an experienced pest control advisor to help manage avocado thrips, especially if their grove is located near the coast where avocado thrips populations are often quite high.

Avocado thrips prefer to feed on young leaves and fruit. Starting mid-February or so, young, new-flush leaves should be monitored for the presence and number of avocado thrips using a 10-14-fold magnifying hand lens. Monitoring should continue on perhaps a weekly basis as young leaves and then fruit start to appear. Experience is needed to decide when or if to treat but, generally, populations of 5-10 larvae (immature thrips) on leaves before fruit set or 3-5 larvae on fruit suggest that thrips levels should be watched carefully and treatment considered as an option (Yee et al. 2003). Normally, adult thrips are ignored in such counts (because they feed sporadically on the fruit) but high levels of adults are suggestive that large numbers of larvae will appear within a week or two (after eggs the females have laid in the leaves or small fruit start to hatch).

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Hass fruit with severe thrips damage in an untreated coastal orchard.

layers of leaves or fruit where it is toxic to avocado thrips when they feed). Oil helps to move Success or

size of fruit present (smaller fruit are more susceptible to damage by avocado thrips; only large numbers of thrips will

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## MANAGEMENT OF AVOCADO THIRPS RESISTANCE IS CRITICAL

In a grove in Ventura County with six Veratran D treatments over two years, 11-fold resistance of avocado thrips developed to this material. As with all three available insecticides for avocado thrips control, the development of avocado thrips resistance is a real concern and unnecessary treatments should be avoided. In particular, because Success and Agri-Mek have similar chemistry, there is concern that use of either material may contribute to the development of resistance to the other.

With few pesticides tested to date having shown promise in control of avocado thrips (i.e., Agri-Mek, Success/Entrust, and Veratran D may be the only effective materials available to us for the near future), and concerns

**TABLE 1. ESTIMATED PER ACRE COST OF ALTERNATIVE AVOCADO THIRPS CONTROL MATERIALS**

Chemical	Rate per acre	Additive	Application method	Estimated cost per treatment per acre
Agri-Mek 0.15 EC	20 fl oz	3 gal oil	100 gpa air	\$ 244
Success 2 SC	10 fl oz	3 gal oil	100 gpa air	\$ 163
Entrust 80%	3 oz	- <sup>a</sup>	100 gpa air	\$ 187
Veratran D 0.2%	15 lbs	3 gal molasses	50 gpa air	\$ 100

*"In the economic analysis we did in Nov. 2003, we did not include oil with Entrust. We now realize, however, that there are several organically approved oils and one of these should be added to Entrust treatments – oil assists with the efficacy of Agri-Mek, Success, and Entrust.*

about the development of resistance, growers should carefully consider whether treatments are justified. Based on past experience with citrus thrips (a species in the same genus as avocado thrips with quite similar biology), we expect that avocado thrips resistance will be a relatively local phenomenon. Growers with multiple, closely timed treatments will more likely see resistance

appear, whereas growers limiting their use of avocado thrips control materials will likely have less trouble with resistance in their groves. Ideally, we recommend growers rotate between available chemicals. Even with high avocado thrips populations, we suggest that no more than a single treatment of Agri-Mek (this is the Section 18 label limit for 2004; but

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**TABLE 2. ESTIMATED PER ACRE COST IN GROVES WITH ECONOMIC AVOCADO THRIPS LEVELS, WITH AND WITHOUT AGRI-MEK**

Chemical used	Estimated Percent using	Estimated number of treatments	Estimated cost per treatment per acre	Total cost per treatment per acre	Estimated percent of harvest downgraded to Standard Grade
<b>SCENARIO 1: AGRI-MEK IS AVAILABLE FOR AVOCADO THRIPS TREATMENT IN 2004</b>					
Agri-Mek	90	1	\$ 244	\$ 244	9
Success	5	2	\$ 163	\$ 326	17
Entrust	1	2	\$ 187	\$ 374	17
Veratran D	4	4	\$ 100	\$ 400	19
Weighted average				\$ 254	9.88
<b>SCENARIO 2: AGRI-MEK IS UNAVAILABLE FOR AVOCADO THRIPS TREATMENT IN 2004</b>					
Success	80	2	\$ 163	\$ 326	17
Entrust	1	2	\$ 187	\$ 374	17
Veratran D	19	4	\$ 100	\$ 400	19
Weighted average				\$ 341	17.38

we suggest no more than one application per year even after this material is registered), a single treatment of Success (if Agri-Mek is used, or no more than two treatments of Success if it is not), and up to three treatments of Veratran D per year. To the degree possible, fewer treatments should be used and one should rotate between use of these three chemicals so that resistance does not appear and avocado thrips can be managed successfully over the long term.

**ECONOMIC ANALYSIS OF THE IMPACT OF AVOCADO THRIPS**

As part of the Section 18 submission for 2004, we examined the cost to growers should Agri-Mek not be available in 2004 for use in California. Cost figures used in this study are based on grower surveys completed by the California Avocado Commission. Per acre treatment costs are based on all available thrips control materials and custom application costs using helicopter application as the large majority of California growers have hillside groves on which ground application is impractical (Table 1). Rates of each chemical listed are at the top of the label for each material although some pest control advisors have had good success with lower rates or amounts of water when thrips levels are moderate (e.g., 12-15 fl oz Agri-Mek or 6 fl oz Success in 75 gallons of water if thrips levels are not too high). Note that a lesser amount of water is popular with Veratran D treat-

ments to concentrate this bait and, for this reason, we used 50 gallons per acre in our analysis.

Based on surveying pest control advisors late in 2003, we also estimated that 1 application of Agri-Mek, 2 applications of Success or Entrust, and 4 applications of Veratran D would be needed for control in a typical avocado grove with moderate to high thrips pressure. No matter which chemical is used, the percentage of the fruit that would have been marketed as Grade A before the avocado thrips became established (before it was discovered in 1996 and spread throughout the Southern California growing region) is now lower with the avocado thrips present. In coastal groves and based on the PCA survey, we estimated that, in an average year, using Agri-Mek would result in about 9% of the production that would have been marketed as Grade A (if avocado thrips were absent) being downgraded to Standard Grade. Using Success or Entrust was estimated to increase the amount downgraded to 17% and using Veratran D to 19% (Table 2). Based on data from the California

Avocado Commission, we estimated that 50.5% of the avocado acreage in California is located in the coastal area where avocado thrips populations typically cause economic damage.

The weighted-average cost across all treatments to control an avocado thrips infestation when Agri-Mek is available is \$254 per acre. Even when Agri-Mek is available, on average 9.88 percent of the crop that was marketed as Grade A will now be marketed as Standard Grade. If Agri-Mek were unavailable, the weighted average of all treatment costs would increase to \$341 per acre, and the percent of production downgraded to Standard would increase to 17.38 percent.

Increases in production costs may cause market prices to increase. The increases in production costs and market price will affect each grower differently. Some growers will be able to continue operating even though their costs are higher, while others will no longer be

**TABLE 3. ESTIMATED INDUSTRY-WIDE ECONOMIC IMPACTS OF THE AGRI-MEK SECTION 18**

	Scenario 1 Agri-Mek Available	Scenario 2 Agri-Mek Not Available	Difference
Overall short-run annual decrease in producer welfare	\$ 14,195,340	\$ 24,696,944	\$ 10,501,603
Losses from fruit downgrading	\$ 3,785,424	\$ 7,541,052	\$ 3,755,627
Losses from increased production costs	\$ 10,409,916	\$ 17,155,892	\$ 6,745,976

able to grow avocados. Inland growers who normally do not need to treat for avocado thrips may actually be better off if higher market prices result.

We developed a market model to capture all these effects and determine the net annual cost of the avocado thrips infestation to the avocado industry in California if Agri-Mek were available for use, and if it were not (see model details in Hoddle et al. 2003a, b). The market model includes growers of Hass and of other varieties in California, those likely to be infested with avocado thrips populations at economically damaging levels

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(i.e., with levels high enough to require treatment), those with low level infestations, and growers without infestations of avocado thrips in other states.

Because the Section 18 Emergency Use Permit allowing use of Agri-Mek must be requested each year, we estimated the losses and benefits to California producers for the short-term. Using this

economic model and the above estimates, the net benefit to California avocado growers of the Section 18 is approximately \$10.5 million in 2004 (Table 3).■

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