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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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March 2004

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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-

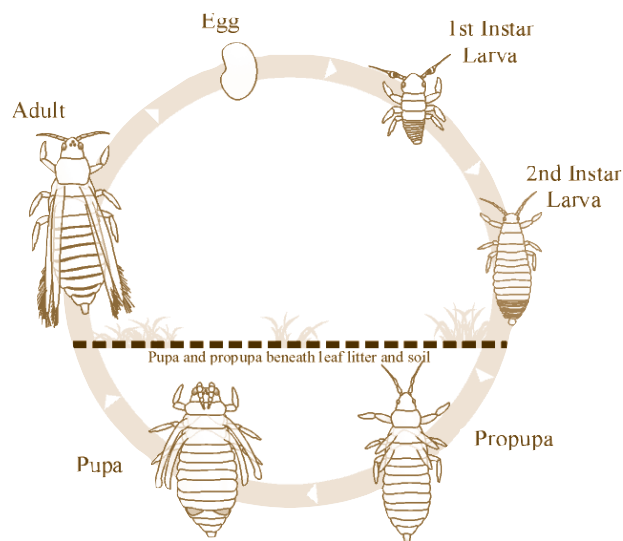
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mesh or larger, and because this material must be consumed by the thrips to be effective (it is a stomach poison with minimal contact activity), it is wise to withhold additives from a Veratran D treatment unless experience has shown that efficacy 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

The Long Road to Section 18 Registration

Guy Witney

Director of Industry Affairs — California Avocado Commission

To most of the California avocado community, approval of the Agri-Mek Section 18 for use on avocado thrips has become a rite of spring. Every year for the last six years the Commission has submitted an application to regulatory agencies, and each year until 2004 the paperwork has worked its way through the California Department of Pesticide Registration (CA-DPR), then through the US Environmental Protection Agency (US-EPA), and finally back to CA-DPR. CA-DPR then gives the green light to county agricultural commissioners who provide the permits to growers to begin treatments.

This was not the case for the current year. While Agri-Mek was approved February 18, 2004 for use on California avocados to treat thrips, the pathway to approval was very difficult. In an industry that demands value from its Commission, several growers and Pest Control Advisors have suggested we describe the difficult process Commission staff and others went through to secure a Section 18 for Agri-Mek in 2004. Here is a very brief overview.

In September 2003, the Commission submitted the application for reauthorization for use of Agri-Mek under US-EPA Section 18 Emergency Exemption to CA-DPR. This was our sixth consecutive application, so the 70-page document, which is now fairly familiar to CA-DPR staff, made it through CA-DPR review rapidly and was forwarded to US-EPA for their approval. It was at US-EPA that things did not go as expected. Normally we know that our application is to be approved by the middle of January just prior to the February 1 spray season start date. This year, because of a newly required in-depth review at US-EPA, the process was delayed. When CAC had not received confirmation of approval by January 20, 2004, we began an investigation to determine the status of our application.

Under relatively new US-EPA rules, a Section 18 Emergency Exemption (which has been approved over several consecutive years) must undergo full, in-depth review

every third year of use. We had our first approved Section 18 in 1999, which was the first full review, and then we have had approval four more times, 2000 – 2003 without a full review. Recognizing this, US-EPA conducted a full review of all of our documentation this year and discovered a serious problem, that is, we have had spinosad (Success) registered for use on avocados since spring 2000. Under ideal conditions, spinosad can give adequate control of avocado thrips and (as US-EPA staff pointed out) this is supported by the results of published University trials. So under Section 18 application rules, we therefore did not have an emergency need for Agri-Mek because, according to US-EPA, we have an effective registered alternative material.

While we all know from experience that Agri-Mek outperforms Success in almost every aspect of avocado thrips control, this did not concern staff at US-EPA because they are obligated to follow the regulations governing the issuance of Section 18 Exemptions. The US-EPA informed CA-DPR on February 6, 2004, that they were intending to turn down our application. We now faced a serious problem – how to convince US-EPA that we needed to have Agri-Mek, and get their staff to understand that the California Avocado Industry stood to lose millions of dollars in revenue without it.

We mobilized a diverse group to help address the problem including UC scientists, Industry PCA's, leading growers, CAC Board members, lobbyists, Syngenta Crop Protection (Agri-Mek manufacturer), Dow AgroSciences (Success manufacturer), the California Secretary of Agriculture, and legislative staff. Dr. Joseph Morse and others at the University of California provided the scientific data comparing Success versus Agri-Mek from 23 field trials done in California since 1999. Dr. Karen Jetter at the University of California Agricultural Issues Center located at Davis provided an independent economic analysis estimating losses to the avocado industry under the scenario of not having Agri-Mek for thrips control. (A sum-

mary of this is provided in the previous article). Several leading PCA's provided testimonial letters, describing their experiences with Agri-Mek versus spinosad. Reuben Hofshi, Chairman of CAC Production Research Committee, and others addressed the helicopter shortage issue in letters and phone calls. Peter Changala, CAC Board member, contacted A. G. Kawamura, California Secretary of Agriculture, who pressed CDFEA staff to work on the issue. Avocado industry lobbyists in Washington DC put pressure on the EPA to keep the process moving forward because the spray season was rapidly approaching, and they readied legislative staff on the issue in case we needed our State Senators to step into the fray.

Over an intense two-week period in the middle of February 2004, a coordinated exchange occurred between CAC, CA-DPR, and US-EPA as we tried everything in our power to sway the latter agency and secure Agri-Mek for use this season. The EPA made several requests for additional information, which was provided by our team; then on Tuesday, February 17, 2004, CA-DPR informed CAC that US-EPA had drafted a letter of refusal to our Section 18 Application which would be mailed out on February 18.

In response to the impending decision, which would likely have cost our avocado industry tens of millions of dollars, CAC requested CA-DPR to try and find a compromise with US-EPA and see whether we could get Agri-Mek for use under a US-EPA Section 18 Crisis Exemption. This is a relatively rare registration category used by state departments of agriculture when decisions are pending at US-EPA – but where the spray season for a particular pest has already begun. In the final hour, US-EPA agreed to a compromise.

We were granted a Section 18 Crisis Exemption for use on avocado thrips in California effective February 18, 2004 and valid until December 1, 2004. Under the agreement growers may not apply more than

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one application per grove per season and it is available for aerial application only. The reasoning we used to get this compromise in the final hour is as follows:

The avocado industry acknowledges that we have had Success available as a fully-registered material for avocado thrips treatment. Under ideal conditions, when Success is applied by ground rig, and applied more than one time, we have seen adequate control of avocado thrips (according to results of published University trials). We also have a large proportion of acreage that is inaccessible by ground rig, thus requiring helicopters for application. However, we do not have the logistical support (simply not enough helicopters available) to spray Success from the air; which would require at least two applications per acre, and probably more, to achieve a reasonable degree of control. We do not believe that Success is as effective as Agri-Mek when applied by air. Data and local PCA experience indicate that a single application of Agri-Mek by air often gives good

avocado thrips control throughout the period of fruit susceptibility.

Under this compromise US-EPA will keep our 2004 Section 18 application "open" and CAC will provide more experimental data on efficacy comparing Agri-Mek and Success both by ground and air from trials to be conducted this spring; an economic analysis of the differences observed; and solid information to support our contention that there is no elasticity in the local aerial applicator business to meet any future large increase in spring-time demand for aerial spraying in avocados (if we were forced to use Success several times per season instead of Agri-Mek once). We will work hard to provide this information in case need to apply for Section 18 registration of Agri-Mek again in 2005. However, we are tentatively expecting full Section 3 Federal Registration of this critical material by next season which will negate the need for further applications.

While CAC has had a barrage of complaints since the issuance of the Section 18, mostly concerning the new restrictions placed on Agri-Mek use in 2004, it should be clear to most that continued use of Agri-Mek is being allowed against all odds, and that this achievement likely saved the industry many millions of dollars. In fact, an independent study conducted by Dr. Karen Jetter at the University of California Agricultural Issues Center (see previous article) indicates that the addition of Agri-Mek to our small battery of thrips control materials will save around \$10 million in avocado industry revenue in 2004.

Special thanks go to Dr. Joseph Morse, Steve Peirce, Dr. Karen Jetter, Dr. Pascal Oevering, Dr. Ben Faber, John Inouye, Ed Ruckert, Stan Van Vleck, Paula Pangle, Paul Reisling, Debbie Stubs, Reuben Hofshi, Dave Machlitt, David Holden, Jim Davis, Matt Hand, Rick Shade, Tom Roberts, Peter Changala and others whose assistance helped secure the label. ■

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MANAGEMENT OF AVOCADO THRIPS 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

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	- ^a	100 gpa air	\$ 187
Veratran D 0.2%	15 lbs	3 gal molasses	50 gpa air	\$ 100

^aIn 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
SCENARIO 1: AGRI-MEK IS AVAILABLE FOR AVOCADO THRIPS TREATMENT IN 2004					
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
SCENARIO 2: AGRI-MEK IS UNAVAILABLE FOR AVOCADO THRIPS TREATMENT IN 2004					
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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