University of California Cooperative Extension
Kern Citrus and Subtropical Fruit
Kern County • 1031 S. Mt. Vernon Avenue • Bakersfield, CA 93307 • Telephone 661-868-6221

October/November 2006

Upcoming Meetings

Positive Points System for Citrus
January 10, 2007
Kern County Cooperative Extension Office
1031 S. Mt. Vernon Avenue, Bakersfield, CA 93307
661-868-6200

Citrus Leafminer Arrives in Kern County

David Haviland, Entomology Farm Advisor in Kern County, informs me that the citrus leafminer has been found by several PCAs in Kern County orchards along Highway 166. His article follows:

Citrus Leafminer Arrives in Kern County

by David Haviland, Entomology Farm Advisor, Kern Co.

Citrus leafminer (not to be confused with citrus peelminer) has recently been reported at multiple locations along Highway 166 from Highway 99 out to Maricopa. This is a new exotic pest that will likely become well established throughout the San Joaquin Valley within a couple of years. It is important for growers to learn about this pest now in anticipation for its arrival in their citrus orchards.

Distribution

Citrus leafminer has a worldwide distribution and is well established in all citrus production regions except for the San Joaquin Valley. Citrus leafminer was first found in the US in Florida in 1993 and has since made it through Louisiana, Texas and into California (Imperial County, 2000). It is now found in San Diego, Riverside, Orange, San Bernardino, Los Angeles, Ventura, Santa Barbara, and San Luis Obispo Counties. In September 2006 live larvae were found in citrus leaves of multiple mature citrus orchards along Highway 166 in Kern Co. The likely source of these infestations is adult moths that flew (likely wind-aided) over the hill from areas around Castaic (Magic Mountain) where this pest is reported to be in high numbers in backyard trees. Adult citrus leafminer moths have also been caught in pheromone traps in very low numbers at sites in Tulare and Fresno Counties, though no live larvae in leaves have been found to date.

Identification

Citrus leafminer is a small worm found feeding beneath the leaf cuticle. The damage looks similar to damage from *Liriomyza* sp. (fly) leafminers found in vegetable crops like tomatoes and melons as well as damage from the larval form of citrus peelminer (moth). Damage to a citrus leaf can have the appearance of severe thrips damage, except that close inspection reveals mines in the actual leaf. Leafminer can be distinguished from peelminer because 1) larvae leave a black trail of feces in their mine whereas peelminer do not, 2) pupae roll up on the edge of the leaf whereas peelminer pupate on fruit or twigs under a silk layer covered with crystalline balls, and 3) larvae are primarily in new leaf flush whereas peelminer larvae are primarily in citrus fruit and suckers. The adult moths are difficult to distinguish without comparing them side by side. However, pheromone traps have been developed for both pests and each pheromone only catches the moth for which it is intended.

Damage

It is important not to confuse damage from citrus leafminer with that of citrus peelminer. Peelminer is a moth whose larva mines many different types of plants, and damages citrus by mining in the surface of citrus fruit. Leafminer, on the other hand, does not have other hosts besides plants in the citrus family Rutaceae, does not damage fruit and only damages young leaves. To mature citrus it is merely a cosmetic pest of the leaves and has little to no effect on the yields or quality of fruit. The concern is that citrus leafminer can cause sufficient foliar damage to 1-3 year old citrus, and will need to be controlled during that period. Establishment of citrus leafminer will also cause changes to nurseries that will have to comply with state protocols prior to shipping trees, and may also cause a decrease in sales to homeowners who are unwilling to buy trees with knurled leaves or trees where the leaves have been stripped.

Control

For mature citrus, control of citrus leafminer will likely be a combination of biological control and tolerance. Despite how bad trees may look, research out of Florida suggests that there are no negative impacts on yield or quality of fruit, and that this pest can therefore be ignored. As for biocontrol, it is anticipated that a native parasitoid, *Cirrospilus coachellae*, that currently attacks citrus peelminer will attack and provide some suppression of citrus leafminer. However, the level to which it is controlled is uncertain. There are also other candidate parasitoid species that are being considered for importation into California.

The major concern is related to control in nurseries and young orchards. Control programs in these situations will likely be chemically intensive, and efforts are underway to develop and document the best management options available.

Credits and Additional resources

Information provided in this newsletter were provided by Beth Grafton-Cardwell (UC), Kris Godfrey (CDFA), and David Headrick (Cal Poly, SLO). Links to additional resources from UC and CDFA can be found at Beth Grafton-Cardwell's citrus entomology web site (http://citrusent.uckac.edu).

For Those Interested in Shipping Fruit to Korea

Note: The following is a release from the California Citrus Quality Council regarding necessary protocols for shipping fruit to Korea. Keeping in close contact with the packinghouse can help keep the grower on-track for meeting protocol requirements for selling fruit to Korea. Grower funding, as part of an assessment on fruit, largely supports the excellent work of the California Research Board and the associated California Citrus Quality Council.

CALIFORNIA CITRUS QUALITY COUNCIL

210 Magnolia Avenue, Suite 3
Auburn, California 95603

Telephone: (530) 885-1894 • Fax: (530) 885-1546

Hugh W. (Wally) Ewart, Ph.D., President: ccqc1946@pacbell.net
Carleen Price, Administrative Assistant: ccqc1314@pacbell.net

DATE: September 25, 2006
TO: California Citrus Packing Houses
FROM: Wally Ewart, Ph. D.
SUBJECT: **First Copper Spray Treatment for Shipments to Korea**

This is an advisory for all California orange packinghouses in all counties regarding the first preharvest zinc-copper-lime treatment for all orange blocks that will be eligible to ship to Korea in the 2006/07 season.

I. The First Required Spray for All Oranges

A. A zinc-copper-lime application must be made between October 15, 2006 and November 30, 2006, for all California oranges (Navels and Valencias) shipped to Korea.

1) When using zinc sulfate (neutral and acidic forms) and copper hydroxide, copper oxide, or basic copper sulfate (i.e., fixed or basic coppers):

(a) The rate of metallic zinc equivalent (mze) must contain a minimum of 2.5 lb mze per acre. The rate of metallic copper equivalent (mce) per acre must be a minimum of 1.65 lbs mce per acre. A minimum of 2 lbs hydrated lime should be added when using 1.65 lbs copper (mce) and a minimum of 4 lbs hydrated lime when using 4 lbs copper (mce) per acre. The material must be applied as a dilute application of no less than 400 gallon per acre.

(b) Higher rates of zinc, copper and lime may be used as local conditions warrant but not to exceed manufacturers labeled rates. Bordeaux sprays in accordance with university guidelines with the addition of zinc also meet the preharvest requirements for exporting oranges to Korea.

2) If zinc-copper Bordeaux applications are used, 3.3 lb metallic zinc, 1.65 lb metallic copper, and 20 lb hydrated lime per acre in dilute application of no less than 400 gal/acre will meet the minimum requirement. (See the attached Tables.)

B. Remember the mix order of these ingredients: zinc, then copper, followed by lime.

C. **The spray must cover the entire tree canopy**. Skirt sprays are not acceptable and would render any block treated by this procedure ineligible for the Korea program. All active ingredients in the spray mix (i.e., zinc, copper, and lime) are required to be reported to the county. This spray record information for all three ingredients must be available at the packinghouse before any phytosanitary certificate can be issued.

D. Copies of the Pesticide Use Reports for applications of zinc, copper, and lime must be on file at the packing facility prior to issuance of the Federal Phytosanitary Certificate.

II. Other requirements for packinghouses and grower blocks including possible second and third spray requirements will be sent after the negotiations conclude in Korea in October.

TABLE 1

First Application 2006-07 Season
Zinc-Copper-Lime Applications
Fixed coppers (e.g., copper hydroxide and copper oxide)

Application Volume	Metallic Zinc/100 gal	Metallic Copper/100 gal	Hydrated Lime/100 gal
400 gal/A	0.63 – 1 lb	0.41 – 0.75	0.5 – 1.0 lb
600 gal/A	0.42 – 0.67 lb	0.28 – 0.5	0.33 – .067 lb
800 gal/A	0.31 – 0.5 lb	0.21 – 0.38	0.24 – .05 lb
Total lb/A	2.5 – 4 lb	1.65 – 3	2 – 4 lbs

TABLE 2

First Application 2006-07 Season
Zinc-Copper Bordeaux Applications
(Zinc monohydrate + Copper pentasulfate)

Application Volume	Metallic Zinc/100 gal	Metallic Copper/100 gal	Hydrated Lime/100 gal
400 gal/A	0.83 lb	0.41 lb	5 – 17 lb
600 gal/A	0.55 lb	0.28 lb	3.3 – 11 lb
800 gal/A	0.41 lb	0.21 lb	2.5 – 8.4 lb
Total lb/A	3.3 lb	1.65 lb	20 – 67 lb

Glassywinged Sharpshooter Numbers on Increase

Glassywinged sharpshooter numbers are elevated in some areas of the San Joaquin Valley. Don't be surprised if more area-wide insecticide treatments are instituted early next year. The degree of cooperation among growers and various agencies in the effort to keep this serious pest under control has been truly impressive.

Shipping Fruit to Australia

Those interested in shipping fruit to Australia need to be concerned about the bean thrips. Information on protocols for monitoring for the bean thrips can be found on Dr. Beth Grafton's website at www.uckac.edu/citrusent. Dr. Beth Grafton Cardwell is a Citrus Entomology Specialist for UC Cooperative Extension with offices at UC Kearney and UC Lindcove Research and Extension Centers. Most of the protocols involve close cooperation with your packing house. Consult closely with your packer/shipper.

Prowl® Herbicide Registered for Bearing Citrus

Some PCAs and growers in the Edison area have been using a mix of Prowl and Goal® for effectively controlling weeds in non-bearing citrus for a number of years. Prowl is now available for bearing trees, but unfortunately Goal is not, and probably won't be. Always read and follow all label directions.

Recent labels of most pesticides can be found on the website www.cdms.net. Remember though, it is the label on or with the container of the California-registered pesticide that largely governs how it is to be used. However, all information that might govern the use of a pesticide is not necessarily contained in the label. Further regulation is written in the California Code of Regulations specifically for some pesticides (for example, restricted reentry intervals) and through general regulations administered by the California Department of Pesticide Regulation and regulations specific to counties in California (for example, when 2,4-D can be used to control weeds in Kern County).

Getting Ready for Frost Season

Although the general consensus appears to be a warmer than normal winter for Winter 2006/07, citrus growers should not become complacent. It takes only one Alaskan storm to bring enough cold air into the Central Valley in an otherwise warm winter to turn our citrus crop to mush. Growers should make sure, at a minimum, that they have the wonderfully inexpensive federal insurance in place for their orchards, that wind machines are in working order, contracts with helicopter companies have been considered for fruit on trees unprotected by wind machines, and thermometers calibrated. Work schedules should be developed for those who will be working at night monitoring temperatures, starting and stopping frost water and wind machines. Wind machines have a propensity to break down when you need them most so the availability of mechanics on a 24 hour basis is usually necessary for extended frost events. Wraps on baby trees that were removed to treat for ants, earwigs, darkling beetles, and whatever else or blew into the next county in one of our south valley windstorms should be replaced. The copper and zinc applied to trees this fall in the whitewash will

help control frost-nucleating bacteria on the leaves and fruit and give the trees a degree or two of added frost protection.

We haven't had a serious frost event for awhile, and I notice citrus creeping out further onto the Valley floor (where the inversion layer is hard to affect with wind machines and where cold air puddles like water). Swales along the foothills, where the trees were toasted in Winter 1990/91 and not immediately replanted, are again filling up with citrus. Protecting trees in these cold areas will be especially challenging. Starting wind machines early in the evening when a radiative frost is predicted can help get warmer air down to the trees earlier if the inversion layer is high. Frost water should be started before temperatures drop below freezing as ice does not flow nearly as easily as liquid water.

Running Frost Water in Citrus **(edited and reprinted from an earlier newsletter)**

A grower recently asked me an excellent question, for which I had no answer and which I passed to Rick Snyder, Research and Extension Biometeorologist, at UC Davis. During frost events the grower did not have enough water to keep running to protect all of the baby trees that were planted. If he ran the system as it was designed he could only keep the water running on ½ of the trees if he ran the fanjet emitters as the system was designed. His question was, "Would it be better to run water on all of the trees at roughly ½ the pressure and volume as opposed to running ½ of the trees at full volume and pressure?"

Rick Snyder's reply is paraphrased as follows:

In general, if there is not enough water being applied, all of the water will freeze quickly and the ice will appear milky white. If the application amount is adequate, there should be a mixture of liquid water and ice on the ground. If the grower irrigates both blocks at the same time and it all freezes and it is milky white, then the grower should only irrigate the colder of the two blocks during the frost night. As for irrigating the other block, it is better if the soil in the other block is irrigated a few days before the frost night, not during the day before the frost night. The soil is irrigated because it improves the thermal conductivity and heat capacity of the soil. However, if the soil is already moist (say near field capacity in the top foot) then irrigation is unnecessary.

Dr. Snyder added that the initial temperature of the water is not too important because most of the energy for protection is released when the water freezing rather than the transfer of heat to the surroundings as the water cools. However, warmer water would help some. Fanjets the cover 50% or more of the orchard floor are much more effective in warming orchard floors than drip systems. Wind machines can alter the relationship as well.

California Red Scale – Always In Our Thoughts

California red scale, as expected with our hot summer, has reared its ugly head again in many orchards in Kern County. In the past, we have had problems with scale resistant to the organophosphate (OPs) and carbamate insecticides that have been available to control this pest. Now there is some evidence that some populations are becoming resistant to pyriproxifen, the insect growth regulator that many growers with OP and carbamate resistant scale have become dependent on. If you suspect that your scale are resistant, Dr. Beth Grafton Cardwell, Citrus Entomology Specialist for UC Cooperative Extension has made the following offer:

We are still accepting samples of scale-infested green fruit for checking for Organophosphate or Esteem resistance in California red scale. We need two grocery bags of fruit. We are conducting the testing at the Kearney Ag Center and so deliveries there are much appreciated. If for some reason you cannot collect the fruit but want the testing done, please let me know. The following page is a sheet of information that should be detached, filled out and turned in with the sample.

California Red Scale Resistance Survey 2006

Beth Grafton-Cardwell
Technical Staff: Greg Montez and Yuling Ouyang, Kearney Ag Center 559-646-6597

Name of PCA or grower contact: _____

Phone number: _____

Date fruit collected: _____

Block Name: _____ County: _____

I would like an Esteem bioassay: **yes or no** (circle one)

I would like a biossay for organophosphate resistance: **yes or no** (circle one)

2005 and 2006 Insecticide treatment history of the block (I don't need herbicides, fungicides, or nutritional sprays). Fill in as much as you can.

Insecticide	Date	Rate	Water volume

Location of block: (description or drawing or fax us a map 559-646-6593)

Questions: Call Greg or Yuling at Kearney 559-646-6597

Craig Kallsen, Citrus, Subtropical Horticulture, Pistachios Advisor