COOPERATIVE EXTENSION UNIVERSITY OF CALIFORNIA

TREE AND VINE NOTES

January 2008

2008 ANNUAL STATEWIDE PISTACHIO DAY

Visalia Convention Center
303 East Acequia - Visalia, California
Wednesday, January 16, 2008
9:00 am - 2:00 pm
On Site Registration begins at 8:00

Pistachio Day 2008 will have three diverse, concurrent sessions starting at 9:00 am and repeating at 11:00 am, with a break at 10:30 and an industry update during lunch. A hot lunch will be provided, (but must be ordered in advance). Registration fee: $20.00. If you have questions, please call Louise Ferguson at 530-752-0507.

CONCURRENT SESSIONS

Times	Session I **Production Management** Moderator: Bob Beede Room: Charter Oak A/B	Session II **Pest Management** Moderator David Haviland Room: Charter Oak C	Session III **Disease and Plant Development** Moderator: Brent Holtz Room: San Joaquin C/D
9:00 a.m. and 11:00 a.m.	**Irrigation with Insufficient Water Supply** David Goldhamer UC Irrigation Specialist	**Emerging Nematode Problems** Michael McKenry Nematologist, UC Riverside	**Botryosphaeria and Alternaria Blights and Management of Resistance** Dr. Themis Michailides Plant Pathologist, UC Davis
9:30 a.m. and 11:30 a.m.	**Nutrition Management** Bob Beede Farm Advisor, Kings County	**Understanding Navel Orangeworm Damage- What Occurred in 2007** Joel Siegel Entomologist, USDA	**Canopy Management** Brent Holtz Farm Advisor, Madera County
10:00 a.m. and Noon	**Evaluating Soils and Water for Production** Blake Sanden Farm Advisor, Kern County	**Managing Mealybugs** David Haviland Entomologist, Kern County	**New Varieties for the California Industry** Craig Kallsen Farm Advisor, Kern County
12:30 p.m.	**LUNCH** **Pistachio Industry Funded Research** Chair California Pistachio Research Board		

2008 North San Joaquin Valley Almond Day

Sponsored by the University of California Cooperative Extension

January 22, 2008 8:30 a.m. -12:00 noon

Stanislaus County Agricultural Center, Harvest Hall
3800 Cornucopia Way
Service and Crows Landing Roads, Modesto

2.0 Hours of Continuing Education Credit Pending

8:00 **Registration**

8:30 – 8:40 **Welcome and Introductions – Roger Duncan**

8:40 – 9:10 **Almond Irrigation, Water Stress & Productivity**
Dr. Ken Shackel, Dept. of Plant Sciences, UC Davis

9:10 – 9:40 **Almond Pruning by the Numbers**
Roger Duncan, Pomology Advisor, UC Cooperative Extension, Stanislaus County

9:40 – 10:10 **Understanding the Role of the Soil Microbial Community in Almond Replant Disease**
David Doll, (Future) Pomology Advisor, UC Cooperative Extension, Merced County

10:10 – 10:30 **Break**

10:30 – 11:00 **Weed Control and Label Updates in Almonds**
Kurt Hembree, Weed Advisor, UC Cooperative Extension, Fresno County

11:00 – 11:30 **Predicting NOW Damage**
Dr. Joel Siegel, Research Entomologist, USDA ARS, Parlier

11:30 – 12:00 **Organic Almond Disease Control**
Dr. Brent Holtz, Pomology Advisor, UC Cooperative Extension, Madera County

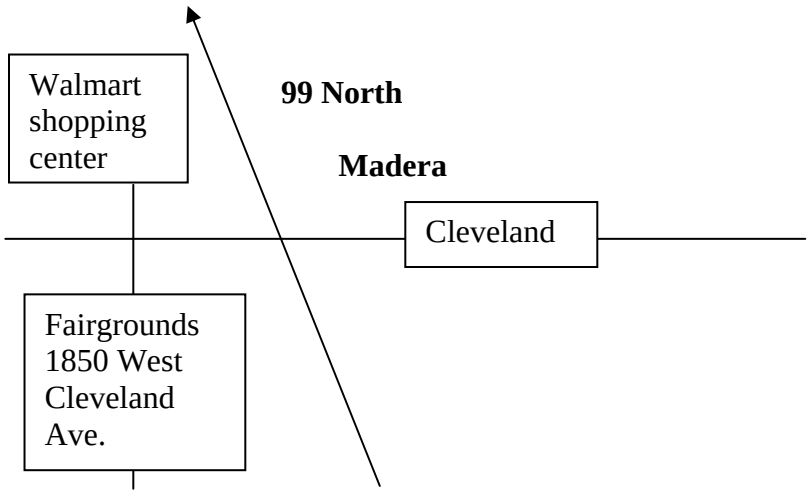
Refreshments sponsored by Yosemite Farm Credit (Brian Lemons)

2008 Regional Almond Meeting

Thursday, January 31, 2008
Madera District Fairgrounds, Women's World
1850 West Cleveland Avenue, Madera CA 93637
8:00 AM-12:30 PM

7:30 a.m.	PCA and continuing education credits sign-up
8:00 a.m.	**Update on laws and regulations** *Madera County Agricultural Commissioner office*
8:30 a.m.	**Leaffooted plant bug biology and management** *Dr. Kent Daane, University of CA Entomology Specialist, UC Berkeley*
9:00 a.m.	**Navel Orangeworm biology and damage predictor models** *Dr. Joel Siegel, USDA-ARS Entomologist, Fresno*
10:00 a.m.	**Almond spur dynamics** *Dr. Bruce Lampinen, University of CA Almond Specialist, UC D*avis
10:30 a.m.	**Break**
11:00 a.m.	**Almond replant disease problem** *Dr. Greg Browne, USDA-ARS Plant Pathologist, UC Davis*
11:30 a.m.	**Almond irrigation in a dry winter** *Dr. Terry Prichard, Water Management Specialist, UC Davis*
12:00 p.m.	**Almond Boom Disease, NOW Efficacy, and Kaolin Trials on Almond** *Dr. Brent Holtz, University of CA Farm Advisor, Madera County*
12:30 p.m.	**Adjourn**

3.5 hours of PCA, CCA and Private Applicators Credit have been requested
A **free lunch** will be served by the Madera County 4-H
Sponsored by the University of California
BASF, Bayer CropScience, Dow Agro Sciences, Syngenta, Valent, United Phosphorous
Please RSVP at 559-675-7879 ext 201



Zinc Applied to Vineyards by Drip Fertigation is Effective and Feasible.

Bill Peacock* and Pete Christensen
UC Cooperative Extension

Zinc (Zn) applied to vineyards with the drip system (fertigation) is effective and feasible, and either zinc sulfate or Zn EDTA chelate can be used. Fertigation is effective since nutrients are placed where roots are highly concentrated, and uptake is supported by continuous high soil moisture beneath emitters. Zn fertigation rates for mature vines are given in Table 1. These rates are for vines on soil with high potential for fixing Zn; fertilizer Zn becomes unavailable for uptake. Soils with greater than 20% clay (loam, clay loam, clay soil textures) and soils with free lime (pH greater than 8) in the surface soil have a high potential for fixing Zn. Application amounts can be reduced for vines on soil with low fixing potential, sandy, loamy sand, sandy loam, silt loam, and acidic soils. Rates should be lowered to a third or less of the given amounts when fertigating one or two year old vines.

Zinc fertigation should be completed two or three weeks prior to bloom. This allows enough time for vine uptake by bloom. Zinc levels in tissue must be above 25 to 30 ppm from early bloom until veraison in order to avoid deficiency symptoms in fruit.

Leaf petioles can be sampled in mid-April and then vines fertigated according to Zn level in tissue; however, that doesn't leave much time to get sampling, analysis, and fertigation done all before bloom. A more practical approach is to keep a historical record of tissue analysis, two or more years, which becomes a good guide for deciding fertigation amounts. An interesting note on tissue analysis is that Zn concentration in tissue varies very little during the course of the season, and so April levels will be similar to September unless vines were fertilized. Therefore, sampling in August or September gives a good indication on what to expect the following spring. Leaf petioles opposite cluster are sampled during the bloom period, while recently mature leaf petioles should be used before or after bloom. Zinc toxicity has never been noted in the San Joaquin Valley; however, Zn concentration in leaf petioles should probably not be allowed to exceed 150 ppm.

Mild zinc deficiency is possible when zinc in leaf petioles ranges from 15 to 25 ppm. Symptoms appear in clusters but with no apparent symptoms in foliage. Fruit symptoms include reduced berry set, small berries among normally sized berries, and the presence of shot berries. For table grape growers even mild fruit symptoms can be problematic.

Moderate to severe Zn deficiency is possible when petiole levels are less than 15 ppm. Deficiency symptoms appear in both foliage and fruit. Foliage symptoms include mottled leaves and "little leaf" symptoms, small leaves with an open petiolar sinus. Shoots and laterals may be stunted with closely spaced nodes. Most of the clusters on the vine show symptoms and under severe zinc deficiency, all clusters are unmarketable for table grapes. Yields are reduced.

A Case Study: Zinc fertigation was evaluated on a mature Ribier table grape vineyard located near Exeter. Vines exhibited moderate zinc deficiency symptoms the previous year, and zinc levels in leaf petioles ranged from 10 to 15 ppm. The vineyard soil was Madera loam containing 20% clay and 38% silt with lime both in the surface and sub soil. The soil had high potential for fixing soil-applied zinc because of the clay and lime content. This was an ideal site to evaluate zinc fertigation.

Drip fertigation treatments were applied on April 23rd using a low and high rate of zinc sulfate and zinc 6.5% EDTA chelate:

1. Zinc sulfate was applied at rates of 70 or 140 pounds per acre (25 or 50 pounds actual zinc per acre). A 12% zinc sulfate solution was used although zinc sulfate (36%) granular is quite soluble, and could have been used as well.

2. Zinc 6.5% EDTA chelate was applied at either 3.7 or 7.5 gals per acre (2.5 or 5.0 pounds actual zinc per acre).

3. Fertigation treatments were compared to an early bloom foliar application of basic zinc (52%) applied at 5.0 pounds per acre (2.5 pounds actual zinc per acre). The foliar spray was a dilute application using 150 gallons per acre.

The trial included an untreated control and the statistical design was a randomized complete block with eight replications and using four vine plots.

Fruit and Foliar Symptoms: Vines were visually graded for zinc deficiency symptoms on August 25th - bottom line for the experiment. Table 3 gives a description of the grading scale along with treatment grades.

The control vines had moderate deficiency symptoms that included mottled leaves with some small leaves with flat petiolar sinus "little leaf" symptoms, and nearly half the clusters showed symptoms (small berries, irregular sized berries, and numerous shot berries). Some of these clusters were not marketable.

Zinc drip fertigation significantly reduced deficiency symptoms compared to the untreated control. Zinc sulfate and zinc chelate treatments were similar in their effectiveness. The higher application rates had slightly fewer deficiency symptoms than the lower rates. Fruit

symptoms were slight.

Basic zinc applied to foliage also significantly reduced symptoms of deficiency. Deficiency symptoms were reduced to levels that were similar to drip fertigation using the low application rates.

Tissue Zinc Levels: The results of tissue analysis are shown in Table 2. Leaf petioles from opposite flower clusters were taken on April 22 just prior to drip fertigation and indicate vines were indeed very low in zinc. Zinc sulfate increased zinc concentration in petioles that were taken two weeks after fertigation during the early bloom period. Zinc levels in leaf petiole tissue increased 2-fold and 5-fold with the 70-pound per acre and 140-pound per acre application rates of zinc sulfate, respectively. Although Zinc EDTA chelate did not elevate petiole levels by bloom; levels in shoot tips taken a few weeks later were higher. This suggests uptake of Zn using zinc sulfate was more immediate than with the Zn EDTA chelate. By July, all fertigation treatments showed significantly higher levels of Zn in shoot tips compared to the untreated control.

Foliar applied basic zinc elevated shoot tip levels on May 17th and the increase was greater than all fertigation treatments. However, the increase was short lived and by July 30th, tissue zinc levels dropped down to that of the untreated control.

Cost: Zinc sulfate or EDTA Zn chelate applied to a vineyard by drip fertigation is feasible. Zinc sulfate 36% cost about $.50 per pound and EDTA Zn chelate, 6.5% solution, is about $12.00 per gallon. Therefore, the material cost for this experiment cost $35 and $70 for the low and high rate of zinc sulfate, respectively. Zinc EDTA chelate cost $44 and $88 dollars, receptively. The fertigation application cost is negligible.

Foliar application of basic zinc cost about $5 per acre for the material and $15 dollars per acre for the application, although it is often piggy backed with the application of other materials. The foliar application is less expensive than fertigation when only one foliar application is necessary. Multiple foliar applications may be necessary when deficiency is severe, and that would make fertigation more competitive.

Conclusion: Vine response to a soil application of Zn is greatly improved with the use of drip irrigation. Drip provides the fertilizer with more continuous wetting to enable Zn movement into the root zone. It can be applied through the drip system or hand-placed directly under each emitter. Optimum rates in trials to date are given in Table 1. Zn sulfate has been more successful than Zn EDTA chelate on a cost-per-acre basis. Early spring, pre-bloom application is preferred. Comparatively high Zn rates are required with drip and the treatment may not last longer than a year. Foliar spray is probably the most economical way to correct most Zn deficiencies unless multiple foliar sprays are required. Economics and assurance of response still favor foliar spray.

***** Bill Peacock is a UC Farm Advisor in Tulare County and Pete Christensen is UC Viticulture Specialist, emeritus.

Table 1. Zinc (Zn) fertigation rates for mature vineyards having moderate to severe deficiencies, on fine textured soil, and with low tissue levels of Zn.*

Zinc product	Drip Irrigation	Cost per Acre
Zinc sulfate** (36% granular)	50 to 100 lbs/acre (18 to 36 lbs actual Zn)	$25 to $50
EDTA Zn chelate (6.5% solution)	3.0 to 6.0 gal/acre (2 to 4 lbs actual Zn)	$36 to $72

* Lower rates are used on young vines and vines on sandy or acidic soils
**Zinc sulfate can also be purchased in 10% and 12% solutions that contain 1.1 and 1.4 pounds of Zn per gallon, respectively.

Table 2. Grapevine uptake of zinc applied in April by drip fertigation using zinc sulfate and EDTA chelated zinc.

Drip Fertigation Treatment	Zinc in petioles 22-April (ppm)	Zinc in petioles 6-May (ppm)	Zinc in shoot tips 17-May (ppm)	Zinc in shoot tips 30-July (ppm)
Control: No fertilizer applied.	15	18	38	35
Zinc Sulfate (36%): 70lbs./acre (25 lbs actual Zn/ac.)	14	46	39	42
Zinc Sulfate (36%): 140 lbs./ac. (50 lbs. actual Zn/ac.)	13	100	41	40
Zinc Chelate (6.5% Solution): 3.7 gal./ac. (2.5 lbs actual Zn/ac.)	10	19	38	42
Zinc Chelate (6.5% Solution): 7.5 gal./ac (5.0 lbs actual Zn/ac)	11	20	40	41
Basic Zinc applied foliar (52%): 5 lbs/ac. (2.5 lbs. actual Zn/ac.)	14	(18)[1]	52	39
	LSD_{05}=	9.7	1.6	4.5

1. Petioles sampled before basic zinc foliar applied

Notes:
1. Zinc applied by fertigation on April 23-two weeks before bloom petiole sampling.
2. Vines were at 30%-50% bloom on May 6.
3. Foliar basic zinc was applied dilute on May 6.
4. Vineyard was Ribier table grapes on Exeter loam soil.

Table 3. Zinc deficiency symptoms visually rated on August 25th using a scale from 1 to 5.

Drip Fertigation	Vine Grade*
Control: No fertilizer applied.	2.8
Zinc Sulfate (36%): 70 lbs/ac or 25 lbs actual Zn;	2.0
Zinc Sulfate (36%): 140 lbs/ac or 50 lbs actual Zn;	1.5
Zinc Chelate (6.5% solution): 3.7 gals/ac or 2.5 lbs actual Zn;	2.1
Zinc Chelate (6.5% solution): 7.5 gals/ac or 5.0 lbs actual Zn;	1.7
Foliar Applied (52% basic Zn): 5 lbs/ac or 2.5 lbs actual Zn.	1.9
	$LSD_{.05}$=0.5

• Visual grading used in Table 3:

1 = None	No symptoms in foliage or fruit.
2 = Slight	No symptoms in foliage; some fruit symptoms on 20% or less of the clusters. Fruit symptoms include reduced berry set, small berries among normally sized berries, and some shot berries.
3 = Moderate to severe	Foliage symptoms apparent with mottled leaves and some “little leaf” symptoms, a small leaf with an open petiolar sinus. Fruit symptoms appear on 20% to 60% of clusters. Some cluster not marketable (straggly, variable berry size, and numerous shot berries). Slight yield reduction.
4 = Moderate	Foliage symptoms obvious with mottled leaves and numerous “little leaf” symptoms along with some stunted lateral and main shoots. Fruit symptoms appear on over 60% of cluster and many are not marketable for table grapes. Yields are significantly reduced.
5 = Severe	Many shoots are severely stunted, with nodes closely spaced, and most leaves show “little leaf” symptoms; all clusters on vine are unmarketable for table grapes, yields are greatly reduced.

Use of Dormant Oil in Pistachio

Bob Beede, UC Cooperative Extension, Kings County

Applied as a control for immature soft scale and Phytocoris, which overwinters in the egg stage, oil also assists in overcoming delayed leafing and erratic bloom caused by inadequate chilling. UC research over ten years has shown that it can also significantly increase nut production in young and mature trees, providing they have an abundance of fruit buds. Harvest was also advanced by about four days. Growers planning on applying dormant oil should do so in mid February. Good results have also been reported in Kern County with mid to late January applications. A three-year oil timing test was performed with Chris Wylie at Agri-World (Madera) in which he faithfully applied 6 gallons of Volck® oil weekly from January 17 to March 7. Volck® is a 476 oil, which indicates the temperature in 0 F at which 50% of the oil "cracks" off from the refinery's distillation tower. Considered a "heavy" but highly refined horticultural mineral oil, Volck® was originally refined by Chevron Chemical, but discontinued by Valent in 2006. Weekly ratings of the Agri-World trial during bud push and bloom confirmed that in the Madera area (one of the higher chilling pistachio regions), the best oil response (uniform and coincidental leaf out and bloom of male and female flowers) occurred from applications during the first two weeks in February. Treatment after mid-February was not as consistent or advanced. Waiting until mid-February also allows the maximum accumulation of "natural chilling" from winter temperatures below 450 F. Volck® has now been replaced with oils similar in their 50% distillation rating, but the carbon-based molecules comprising the oil have less range in molecular weight. This results in a slightly faster rate of breakdown on the plant tissue, which may affect their insecticidal and rest breaking efficacy. Britz Ag Chemicals is one company marketing a Volck®-like oil registered for pistachios. Its 50% distillation temperature is 4700 F and I have confirmed its efficacy and safety on pistachio. Other oils researched and registered for pistachios include oils with 415 and 4400 F distillation temperatures. Oils "cracking" from the distillation refining tower at these lower temperatures are lighter in molecular weight. Lighter weight oils provide less risk of phytotoxicity (injury to plant tissue).

My research with oil over ten years indicates pistachio is quite tolerant of dormant oil application. However, this is NOT to say oil damage cannot occur. I witnessed true oil burn for the first time on six-year-old trees in 2005 in Tulare County. It was isolated in one area of the block and the adjacent row showed no symptoms. The cause was never determined. The injury was limited to loss of vigorous, one-year-old wood in the tops of the canopies. Excessive vigor and low carbohydrates was suspected.

My research indicates oil with higher 50% distillation temperatures (470 oil) provides better rest breaking effects than lighter oils when the chilling hours are less than 700 hours. . Such a test was performed at Tejon Farming (base of the Tehachapi's) during the 2003 season where only 550 chilling hours were recorded. A 470 oil applied in mid-February resulted in 50% bloom on April 10 compared to May 1 for the untreated trees. Trees treated with a 415 oil were about five days behind those treated with 470 oil. Unfortunately, yield data collection was not possible.

Oil is not for everyone. I would treat mature trees in good chilling years only if early harvest was required to initiate processing. It is a tool with many factors affecting its performance. It cannot put buds on trees! Nor can it overcome deficit irrigation, which significantly limits the tree's productive capacity from low carbohydrates and insufficient fruit wood. Oil applied at sprayer speeds too fast for optimal coverage, improperly timed, applied to stressed trees, used at too low a concentration, applied by tractor drivers who miss rows, or used in an area with potential spring frost can easily negate any benefits of use.