Cooperative Extension • University of California

Central Valley POSTHARVEST newsletter

Contents:

UC COOPERATIVE EXTENSION
Department of Plant Sciences, UC Davis
located at Kearney Agricultural Center
9240 South Riverbend Avenue
Parlier, CA 93648 / USA
(559) 646-6500

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Carlos H. Crisosto, Editor

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16TH ANNUAL FRUIT RIPENING & ETHYLENE MANAGEMENT WORKSHOP

When: February 25 and 26, 2010
Where: Kearney Agricultural Center, Parlier

FOCUS ON RIPENING and ETHYLENE MANAGEMENT. This workshop, presented by the UC Davis Postharvest Technology Research and Information Center, is intended for shippers and destination (wholesale and retail) handlers who are involved in ripening fruits and fruit-vegetables. The workshop

focuses on how to increase profits by delivering ready-to-eat, delicious fruits and fruit-vegetables to the consumer.

2010 COORDINATOR. 
Carlos Crisosto has more than 20 years of experience as an extension specialist, and specializes in the postharvest biology and technology of fresh fruits. The goal of his research program is to develop a better understanding of the orchard factors and postharvest factors that control fruit flavor and shelf life, and to develop technology to overcome fruit industry problems.

INSTRUCTORS:

- Mary Lu Arpaia, Dept. of Botany & Plant Sciences, UCR
- Carlos Crisosto, Dept. of Plant Sciences, UCD
- Marita Cantwell, Dept. of Plant Sciences, UCD
- Deirdre Holcroft, AgroFresh, Inc.
- Dennis Kihlstadius, Produce Technical Services
- Beth Mitcham, Dept. of Plant Sciences, UCD
- Michael Reid, Dept. of Plant Sciences, UCD
- Jim Thompson, Dept. of Biological & Agricultural Engineering, UCD
- Florence Zakharov, Dept. of Plant Sciences, UCD

TOPICS:

- The Importance of a Retail Ripening Program
- Fruit Development, Ripening & Quality Relationships
- Biology of Ethylene Production and Action in Fruits
- Ripening Facilities & Equipment
- Temperature Management
- Organoleptic Quality Measurement
- Focus on: Banana, Stone Fruit, Avocado, Pears, Fruit-Vegetables & Melons, Mangos, and Citrus
- Ethylene Inhibition & Control
- SmartFresh & EthylBloc: Tools to Control Ripening & Senescence
- Maturity
- Packaging
- New and Emerging Technologies for Ripening Management
- The Future of Ripening: Designing a Ripening Program (Breakout Sessions)
- Demonstrations (Breakout Sessions)

Enrollment Fee and Deadlines:
The enrollment fee of $700.00 for this 2-day workshop includes all *classroom instruction, lab activities, course materials, morning and afternoon coffee breaks, and lunches*. Your enrollment is requested by February 11, 2010. Reservations will be made on a first paid, first served basis. There is a limit of 50 for the workshop, and a waiting list will be available for additional registrations.

If your plans change: Refunds, less an $80 processing fee, will be granted if requested no later than seven calendar days before the course begins. At that time, you may also discuss sending a substitute. We reserve the right to discontinue, postpone, or combine classes, and to change instructors. Every effort will be made to notify enrollees of any changes or cancellations.

Date, Time, Location:

Date: February 25-26, 2010
Location: UC Kearney Agricultural Center
9240 S. Riverbend Ave., Parlier, California.
Time: 9 a.m – 5 p.m on Thursday, February 25th (registration opens at 8:30 a.m.), and 9 a.m. – 4 p.m. on Friday, February 26th.

ENROLLING IS EASY!

By Mail. Complete the enrollment form on the workshop brochure and send it with your check to: Attn: Pam Devine, Postharvest Technology Research & Information Center; Dept. of Plant Sciences MS2; UC Davis; One Shields Avenue; Davis, CA 95616.

By Phone. Call us at (530) 752-6941. Please have your Visa, MasterCard, or American Express account number handy.

By Fax. Fax your completed enrollment form from the workshop brochure, along with credit card information to: (530) 754-4326.

On Line. Link to the secure registration site, and enroll on-line.

FOR MORE INFORMATION:

We invite you to take a look at our 2010 brochure, or contact the following:

Technical Content Coordinator (2010)
Carlos Crisosto
Email: carlos@uckac.edu

Registration Desk
Pam Devine
Email: pwdevine@ucdavis.edu
Phone: (530) 752-6941

RIPENING GUIDELINES FOR KIWIFRUIT RECEIVERS

Carlos H. Crisosto
University of California, Davis
Kearney Agricultural Center
PH: (559) 646-6596
E-Mail: carlos@uckac.edu

Featuring "ready to eat" (ripe) kiwifruit in your stores has proven to increase shelf turns at retail – a key component in produce department profits. A number of California kiwifruit growers and shippers are using our preconditioning protocols to supply you with ripe fruit early in the season. All California shippers can precondition upon request.

This information is designed to assist you in providing ripe kiwifruit to your clientele everyday. This brochure includes a simple guide to handling preconditioned kiwifruit and information on how to ripen kiwifruit yourself at the warehouse or store levels.

The easy-to-follow format outlines the following items:

- Determining stage of ripening
- Handling preconditioned kiwifruit
- Temperature ripening
- Ethylene ripening

Determining Stage of Ripening

Fruit firmness is the best measurement of ripeness. Fruit firmness is defined as the force necessary to break the flesh tissues and it is related to different ripening stages. For example, fruit firmness of a mature fruit varies from 16-12 pounds. During ripening, softening occurs, thus fruit firmness decreases reaching values of 2-4 pounds. When fruit reaches 2-4 pounds it is considered ripe or "ready to eat." This is the level that kiwifruit will achieve its best eating characteristics. Minimum shipping firmness is suggested as 5 pounds, but it varies according to packing. Fruit with firmness below this level becomes more susceptible to physical damage during transportation and handling.

To determine the ripening stage, kiwifruit which arrive at your warehouse should be tested for flesh firmness using a standard fruit penetrometer with an 8.0 millimeter tip (5/16"). Fruit firmness should be measured on warm fruit (55-77°F).

As a general rule, non-preconditioned kiwifruit received in your warehouse which have been in storage less than four weeks or have a flesh firmness level of 8-10 pounds or greater should be treated further by using ethylene treatment to enhance ripening at the warehouse or store levels. Fruit which have been in storage equal to or more than four weeks or have a flesh firmness of less than 8 pounds can be ripened to optimum levels by temperature management.

Ethylene Ripening

Kiwifruit can be treated in existing banana or tomato ripening rooms using 10-100 ppm of ethylene per 6 hours. To avoid or reduce fruit shriveling, kiwifruit should be placed in ripening rooms in tray pack or volume fill packages with polyliners. Temperature setting postripening treatment will be set according to their predicted fruit consumption schedule using the relationship between post-treatment temperature and rate of softening (Table 1).

Handling Pre-Conditioned Kiwifruit at the Warehouse/Store

Pre-conditioned kiwifruit firmness must be tested upon arrival to the warehouse or retail store and handled according to its rate of softening (Table 1) and your rotation time.

Fifteen kiwifruit may be taken from the upper corner box in the pallet. A mature kiwifruit is usually harvested and shipped with a flesh firmness of 16-12 pounds-force (hard). Pre-conditioned kiwifruit should arrive at destination warehouses with firmness near 6-12 lbs-force but never lower than 4-5 lbs-force. Fruit arrival temperature should be lower or equal to 50°F.

Kiwifruit should always be kept at low temperatures (below 45°F), except if they are going to be consumed within 3 days. Keep kiwifruit enclosed with liners as long as you can.

Cooled kiwifruit enclosed with liners should be moved to the retail market before they reach a firmness of lower than or equal to 4-5 lbs-force to avoid vibration and impact bruising damage during transportation and handling (shipping point).

After delivery to the retail store, when kiwifruit reach the room temperature of 20-25^{o}C (68-77^{o}F), preconditioned kiwifruit will lose nearly 3 lbs-force per day. If kept at 7.5 to 0^{o}C (45 to 32^{o}F), kiwifruit will soften at a rate of ≈2.0 lbs-force per day (Table 1). As kiwifruit reach 2-3 pounds and start to deteriorate during display (warm rack), kiwifruit can be placed in a cool room overnight or transferred to a cold rack if it is available to prolong their postharvest life. Frequent rotation and placing the softest kiwifruit at the front of the display are advised.

Consumers should be informed that preconditioned kiwifruit or ready-to-eat (2-3 lbs-force) kiwifruit must be refrigerated if they are not eaten immediately.

Temperature Ripening

If the flesh firmness is more than 5 pounds, but less than 10 pounds, kiwifruit ripeness can be triggered and controlled at your warehouse by temperature management. The fruit temperature should be adjusted according to the anticipated consumption schedule based on the rate of softening (Table 1).

Table 1.

Rate of Kiwifruit Softening after Ethylene Treatment at 20ºC (68ºF).

Temperature		Rate of Softening
^{o}C	^{o}F	lbs/day
0	32	1.2
5	41	1.4
7.5	45	1.9
20	68	3.4 - 3.7

UPDATE ON OPTIMUM PROCEDURES FOR RIPENING KIWIFRUIT

Carlos H. Crisosto
University of California, Davis
Kearney Agricultural Center
PH: (559) 646-6596
E-Mail: carlos@uckac.edu

Most consumers prefer to purchase kiwifruit that are near ripe ("ready to eat"). To ensure good tasting, "ready to eat" fruit, kiwifruit should be ripened at any step during postharvest handling before consumer consumption. This is essential for early season, freshly harvested kiwifruit. To assure good flavor of kiwifruit when ripe and maximum storage potential, we suggest picking them when they reach at least a minimum of 6.2% SSC measured in the field or ~15-16% dry weight (DW). Using either parameter, the titratable acidity at consumption should be below 0.9%. We use firmness measurements at maximum maturity to protect kiwifruit from mechanical damage and fast softening during storage. Kiwifruit below 14 pounds are physiologically active (ethylene producers) and may become a source of ethylene contamination to other sound kiwifruit. Flesh firmness is the best indicator of kiwifruit ripening and best predictor of shelf life. Fruit that measures 2-3 pounds-force flesh firmness is ripe and "ready-to-eat."

Ripening at the Shipping Point Ethylene Pre-conditioning Treatment

Ethylene applied at 100 ppm by using the "shot system" for 12 hours within a 0 to 20°C (32 to 68°F) temperature range will induce ripening as indicated by uniform kiwifruit softening and starch conversion into sugars. Ethylene exposure can be shortened to 6 hours by using a catalytic generator (C_2H_4) or flow-through application system. Ethylene pre-conditioning treatment (100 ppm for 12 hours) is only effective on freshly harvested kiwifruit or those that have been in cold storage for less than 5 weeks. Fruits kept in cold storage for longer than 5 weeks will ripen upon transfer to ripening temperatures of 59-70°C (15-21°F) by their own ethylene so exogenous ethylene application is not needed.

The temperature setting during treatment and shipment should be adjusted according to the anticipated consumption schedule. To prevent softening due to delayed shipments, apply ethylene to cold kiwifruit. Cold kiwifruit treated at near 0°C (32°F) and maintained at that temperature may be held up to 5 weeks. These kiwifruit will reach a firmness of about 3 pounds in 2 to 3 days after being transferred to 20°C (68°F).

Application of Ethylene Pre-conditioning Treatment

Place kiwifruit in a ripening room with good temperature and relative humidity control. The type of kiwifruit container such as tray pack, clam shell, volume fill packages, or tri-wall containers with polyliners do not interfere with the preconditioning treatment including ethylene application. The ripening room should be located far away from any packing facilities to avoid ethylene contamination of long-term storage kiwifruit. High relative humidity (90-95%) is especially recommended when ripening is carried out at temperatures higher than 7.5°C (45°F).

The temperature setting during treatment and shipment should be adjusted according to the anticipated consumption schedule (Table 1).

When ethylene treatment is applied to warm kiwifruit, they will soften very fast even when stored at cold temperatures after the treatment. If shipping is delayed after treatment, fruit will reach a firmness of about 3 pounds-force within six days when held at 0°C (32°F).

Table 1. Rate of kiwifruit softening after ethylene treatment at 20ºC (68ºF).

Temperature °C	Temperature °F	Days to reach a firmness of 3 lbs-force
0	32	6.5 to 7.0
7.5	45	6.0 to 7.0
20	68	3.0 to 4.5

Cold kiwifruit (~33°F) treated at or near 0°C (33°F) and maintained at that temperature may be held up to 5 weeks. These cold treated kiwifruit will reach a firmness of about 3 pounds-force in 2 to 3 days after being transferred to 20°C (68°F). In both cases, the temperature setting during storage and transportation should be close to 0°C (32°F).

Ripening at the Retail End

As a general rule, non-preconditioned ripened kiwifruit received in your warehouse that have been in storage less than 4-5 weeks or have a flesh firmness level of 8-10 pounds or greater should be ripened by using ethylene at warm temperatures.

Pre-conditioned kiwifruit firmness must be tested upon arrival to the warehouse or retail store and handled according to its rate of softening and your rotation time. Fruit that have been in storage equal to or longer than 4-5 weeks or have a flesh firmness of less than 8 pounds can be ripened close to "ready to eat" by temperature management only.

In all cases, temperature conditions for kiwifruit during storage treatment should be adjusted according to your anticipated marketing/selling schedule. The flesh softening rate of kiwifruit is about 2.0 pounds per day when exposed to 20°C (68°F). Softening can be slowed down when fruit is stored at lower temperatures.

In general, kiwifruit should always be kept at low temperatures below 7.5°C (45°F) and enclosed with liners, except if they are going to be consumed within 3 days.

References

Crisosto, C.H. 1994. Ripening guidelines for kiwifruit handlers. Report to California Kiwifruit Commission, 4 pp.

Crisosto, C.H. 1997. Final preconditioning guidelines for kiwifruit shippers. Central Valley Postharvest Newsletter 6(1-2):1-4.

Crisosto, C.H. and G.M. Crisosto. 2001. Understanding consumer acceptance of early harvested 'Hayward' kiwifruit. Postharvest Biology and Technology 22:205-213.

Crisosto, C. and F.G. Mitchell. 2000. Postharvest handling systems: small fruits. III. Kiwifruit, In: A.A. Kader (ed), Postharvest Technology of Horticultural Crops, Third Edition, DANR Publication #3311.

Crisosto, C.H., G.M. Crisosto, and D. Garner. 1997. Kiwifruit storage compatibility. Preliminary Report to the California Kiwifruit Commission, 1997. 5 pp.

Crisosto, C.H., D. Garner, and G.M. Crisosto. 1997. Kiwifruit preconditioning protocol. Acta Horticulturae 444(2):555-559.

Crisosto, C.H., D. Garner, and K. Saez. 1999. Kiwifruit size influences softening rate during storage. California Agriculture 53(4):29-31.

Crisosto, C.H., D. Garner, and B. Shaver. 1992. Studies on kiwifruit ripening, Progress Summary Report, 1992. Report to Kiwifruit Commission, 1 p.

Crisosto, C.H., M.A. Ritenour, D.T. Garner, and G.U. Crisosto. 1996. Affects of maturity and postharvest factors on the ethylene requirement for kiwifruit ripening. 1995-96 Kiwifruit Report. California Kiwifruit Commission, Sacramento, CA, 20 pp.

Ritenour, M.A., C.H. Crisosto, D.T. Garner, G.W. Cheng, and J.P. Zoffoli. 1999. Temperature, length of cold storage and maturity influence the ripening rate of ethylene-preconditioned kiwifruit. Postharvest Biology and Technology 15:107-115.

NEW KIWIFRUIT DRY WEIGHT PROTOCOL

Carlos H. Crisosto, Janine Hasey, Celia M. Cantin, Sandra Garibay, and Gayle Crisosto
Department of Plant Sciences
University of California, Davis

Kiwifruit Sampling Protocol

Preliminary Field Sampling

1. Three healthy vines across the vineyard will be chosen for dry weight (DW) sampling.

2. Facing the trellis with the trunk of the vine as the center, the vine is divided into five equal sections: two to the left of center (upper and lower), the center and two to the right of center (upper and lower).

3. Six fruits are picked, from one side of the vine to the other, in each section on each of the three vines (30 per vine).

Preliminary Box Sampling

1. Five boxes from the largest and smallest fruit size of the lot will be selected across the lot for dry weight (DW) evaluations.

2. Three fruit from each box-size will be used for DW determinations.

Materials

Picture 1. Dehydrator: Nesco/American Harvest Snackmaster® Pro Food Dehydrator Product No. FD-50 http://nesco.com ($59.95). Automatic timer: GE 7-day home Security Timer DESC.: GE5112N-71M4SP Kmart ($7.99). 6 Outlet Metal Surge Protector: Power Sentry or comparable, Walmart ($12.77).

Picture 2. Balance, comparable to Denver Instruments Model MXX-212 with a capacity of 210 g, readability of 0.01 g, taring range of 0-210 g. If purchased from Fisher Scientific includes operations manual and power supply and calibration weight, cat. No. 01-915-02 ($315.40).

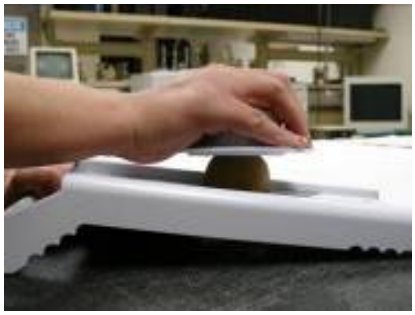
Picture 3. Multi Slicer: Progressive 6 piece Mandolin Multi Slicer #HG50 Progressive.com, Marshall's, Amazon.com ($10.99).

Table 1. Information on materials necessary to measure kiwifruit dry weight (DW).

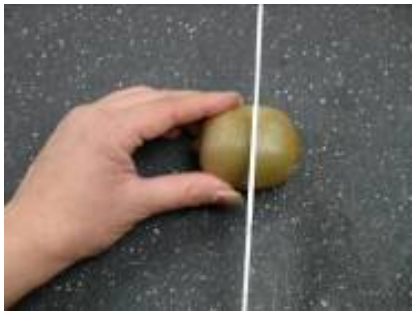
Material	Place – Price	Special Specifications
Dehydrator	http://nesco.com – $59.95	Nesco Product # FD-50
Automatic Timer	Kmart – $7.99	GE5112N-71M4SP
6 Outlet Surge Protector	Walmart – $12.77	Any comparable
Multi Slicer	Progressive.com – $10.99	Progressive Product No. HG50
Balance	Fishersci.com – Cat. No. 01-915-02 ($315.40)	Denver Instruments Model MXX-212, capacity 210 g, readability 0.01 g, taring range 0-210. Be sure the balance includes the power supply.
6" Sharp Knife	Any	
Clip Board	Any	
Cutting board	Any	
Thermometer	Free	carlos@uckac.edu

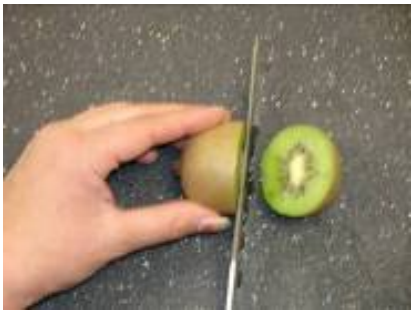
Drying Process Procedure

a. The dehydration process should take place in a secure and clean area such as a kitchen or small quality control laboratory.

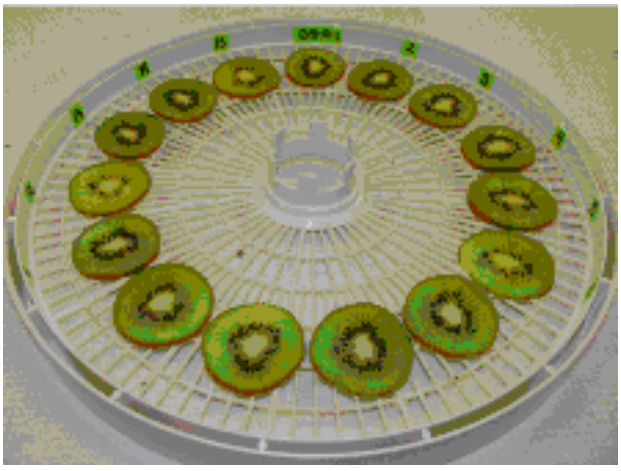


b. Take the 15 kiwifruit samples (without peeling them) and cut off 2/3 of the kiwifruit perpendicular to its long axis by using a sharp knife, then use the vegetable slicer to cut off a 1/8" thick slice from the center of the fruit.





c. Identify and label lot sample (column 1 in data sheet). As each dehydrator has three turntables and each can hold 15 samples at a time, we recommend using each turntable level for each lot sample (15 kiwis) to avoid potential sample confusion. Thus, we can run three lots per each 10 hours per dehydrator.



d. Within each turntable, assign a number to each slice to correspond with the position in the dehydrator (column 2 in data sheet). As each dehydrator has three turntables and each can hold 15 samples at a time, we recommend using each turntable level for lot sample (15 fruit) to avoid potential sample confusion. We suggest always working clockwise from turntable label to avoid confusion.

e. Weigh each slice and record the initial weight (g), to the nearest hundredths, and dehydrator position number.

f. When all of the sample slices have been placed in the dehydrator, turn on the automatic timer on the dehydrator for approximately 8 hours and 45 minutes.

g. After 8 hours and 45 minutes, reweigh each slice and record the final weight on your data sheet. Place the slices carefully back in the same positions in the dehydrator.

h. Run dehydrator for two hours longer and check weight again and record it under the "check weight" column in your data sheet. Compare the weights between the last two columns on your data sheet. If the weight has not changed for each sample, the dehydration process is done. Be sure that burning does not occur anytime during the dehydration process. Be sure that air temperature does not increase higher than 160^{o}F (71^{o}C).

i. If samples are dehydrated overnight using an automatic timer for 8 hours and 45 minutes or if the dehydrator has been off for a while before you recorded DW, warm up the dehydrators for about 30 minutes before the slices are weighed (final weight). Then follow the steps from step F on the protocol.

Data Sheet Template

SAMPLE ID	DATE	POSITION IN TURNTABLE	FRESH SLICE WEIGHT (TIME:)	FIRST DRY SLICE WEIGHT (TIME:)	SECOND DRY SLICE WEIGHT (TIME:)
		1			
		2			
		3			
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			
		15			
Average					
Standard Deviation					

We thank Barbara Windmiller, Waine Aalto, and John Fagundes for their comments on this protocol.

FUTURE DATES

2009 Winter Tree Fruit Meeting. December 2, 2009 at the Kearney Ag Center, Parlier. For more information, see program on next page.

16th Annual Fruit Ripening and Ethylene Management Workshop. February 25 & 26, 2010 at the Kearney Agricultural Center, Parlier, CA. For further information, see details on pages 1-3, or contact Carlos H. Crisosto at carlos@uckac.edu or (559) 646-6596.

First Winter Postharvest Short Course. February 21 to 25, 2011 at the Kearney Agricultural Center, Parlier, CA. For further information contact Carlos H. Crisosto at carlos@uckac.edu or (559) 646-6596.

Upcoming events are posted on the Postharvest Calendar at the Agriculture and Natural Resources, University of California (ANR) website at: http://ucce.ucdavis.edu/calendar/calmain.cfm?calowner=5423&group=w5423&keyword=&ranger=3650&calcat=0&specific=&waste=yes

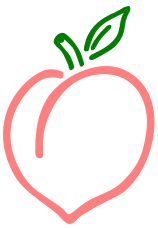
Information about upcoming events can also be found on the Postharvest Technology Research and Information Center website at http://postharvest.ucdavis.edu/:

UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

WINTER TREE FRUIT MEETING

Wednesday, December 2, 2009

Kearney Agricultural Center
9240 S. Riverbend Avenue, Parlier



8:00 am	**Registration**
8:30 am	Peach Twig Borer Management and Potential for Resistance *Walt Bentley, IPM Entomologist, Kearney Ag. Center, Parlier*
8:55 am	Mechanical Thinning *Scott Johnson, Pomologist, Department of Plant Sciences, UC Davis*
9:15 am	Voluntary Tree Fruit Residue Screening *Mike Reimer, Grower*
9:20 am	Best Management Practices for Herbicide Performance *Kurt Hembree, Farm Advisor, UC Cooperative Extension, Fresno County*
10:00 am	**Break**
10:30 am	Skin Burning of White Flesh Varieties *Carlos Crisosto, Postharvest Physiologist, Department of Plant Sciences UC Davis*
10:55 am	Dwarfing Rootstocks for Stone Fruit *Ted DeJong, Pomologist, Department of Plant Sciences, UC Davis*
11:15 am	Integrating Tree Architecture and Rootstock Vigor *Kevin Day, Farm Advisor, UC Cooperative Extension, Tulare County*
11:40 am	Katydid Update *Walt Bentley, IPM Entomologist, Kearney Ag. Center, Parlier*
11:50 am	Zinc Nutrition Update *Scott Johnson, Pomologist, Department of Plant Sciences, UC Davis*
12:00 pm	***LUNCH*** Catering by Uncle Harry's Classic Meals, Reedley

Following the Winter Tree Fruit Meeting
Ted DeJong, Pomologist, Department of Plant Sciences, UC Davis
will present a 1-hour seminar on
Understanding Shoot Growth and How Trees Grow

Return lower portion

Cost: $10 per person (includes lunch)

Please preregister no later than Wednesday, November 25, 2009
NOTE: Payment will be accepted at the door, but no guarantee of lunch

For further information contact: Diana Nix (559) 646-6526

Send checks payable to
UC Regents to:
Diana Nix
Kearney Ag Center
9240 S. Riverbend Ave.
Parlier, CA 93648

Name(s) _____ _____

Address _____

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