Sacramento Valley Almond News
July, 2014
University of California
Agriculture and Natural Resources | Cooperative Extension

In This Issue

Produced by:

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UCCE Farm Advisor
Colusa, Sutter, Yuba, Counties

New IPM Advisor Introduction

Emily J. Symmes, UCCE Area IPM Advisor, Butte, Colusa, Glenn, Sutter, Tehama, and Yuba Counties

In June 2014, I began working as the Area Integrated Pest Management (IPM) Advisor for Butte, Colusa, Glenn, Sutter, Tehama, and Yuba Counties based out of the Butte County Cooperative Extension Office in Oroville. I was born and raised in the Sacramento Valley (mostly Chico) before heading off to pursue my education in the early 2000s, returning to live in the Durham area in 2012.

I began working in agriculture as a young teenager, and quickly decided that I wanted to pursue a career where I could serve the agricultural community and its consumers while advancing pest management practices. I earned B.S. and M.S. degrees in Entomology from UC Riverside, where my study and research emphasized insect mating and feeding behaviors and the spread of plant pathogens by insects, specifically whiteflies and aphids. In 2012, I completed my PhD in Entomology at UC Davis, where my research focused on alternatives to current monitoring and management practices for aphid pests in prune orchards, using aphid sex pheromones to improve monitoring capabilities and impact pest and natural enemy populations.

I have enjoyed numerous opportunities to work in many different aspects of agriculture. In my early years, I started by fielding phone calls and acting as a field scout for pest management consultants. Later, while contributing to academic and applied research, I became part of a great network of information sharing among Extension Specialists, Advisors, growers, PCAs, and others. I look forward to working with Sacramento Valley growers and continuing to be a part of our agricultural community. Please feel free to contact me any time at ejsymmes@ucanr.edu or at the Butte County UCCE office in person or at (530) 538-7201.

New Farm Advisor Introduction

Katherine Pope, UCCE Farm Advisor Sacramento, Solano and Yolo Counties

I'm excited to have recently joined the UC Cooperative Extension team as the Farm Advisor for almonds, prunes and walnuts in Sacramento, Solano and Yolo Counties. I grew up in Sacramento and Yolo Counties, mostly in south Sacramento, and on a boat between West Sac and Clarksburg. I am excited to be able to put down roots and contribute to the continued prosperity of agriculture in my home region.

After straying from California in my college years, I returned to UC Davis in 2008 for a Ph.D. in Horticulture and Agronomy and an M.S. in International Agricultural Development. My dissertation research centered on temperature and bloom timing in

challenges and opportunities, to getting to know folks, and to working together to find ways for UC research to best be of service to you, the growers. Please feel free to call (530-666-8733), email (kspope@ucanr.edu) or just stop by the UCCE Yolo County office at 70 Cottonwood Street in Woodland, to ask questions, share concerns, or to just introduce yourself.

Advisor Retirement – Thanks!

Joe Connell, UCCE Farm Advisor, Butte County

I am retiring on June 26th after nearly 34 years as an orchard and landscape horticulture Farm Advisor in Butte County. What a great experience this has been! It's been quite an honor to work with farmers and agriculture in communities throughout Butte County! What a privilege to work with so many talented UC scientists and educators who brought their expertise to Butte County to help us solve our local problems!

I can't think of a better job than to work with all of the fine growers, PCAs, and others in the Ag Industry I have come to know. In gratitude, I want to say "Thanks!" for helping me learn and grow over the years and for making this such an enjoyable career.

Thirty-eight years ago in 1976, I began work with UCCE in Stanislaus County as a Summer Assistant to Farm Advisors Norman Ross and Jewell Meyer. In 1977-78 I was blessed by a Farm Advisor Internship with UCCE Advisors Steve Sibbett in Tulare County and Clem Meith in Butte County. I learned much from these experienced Advisors and I will be forever grateful to them. I became a Fresno County Farm Advisor working with nut crops, citrus and subtropicals in 1978. I moved to Butte County in 1980 to serve as Farm Advisor working with almonds, olives, citrus and landscape horticulture. There have been other changes in crops and responsibilities over the years but working with local growers and our good research cooperators has been great fun.

Average almond yields per acre have doubled in the last 30 years. This is the result of variety improvements, changes in pruning practices, planting density, harvest timing, and better pest and disease control materials with greater safety for applicators, consumers, and the environment. I am pleased to have been able to play a small role in these improvements by working with many of you.

Our UC ANR administration called for position proposals in January and we submitted four proposals for Butte County including one for a new Orchard Systems Advisor (position #038 on the list). In our system, vacancies are not automatically re-filled but rather proposals are reviewed and evaluated based on need from a statewide perspective. These proposals are posted on-line and you have an opportunity to let our administrators know what impact and value a particular position would bring to your operation. I encourage you to let your thoughts be known. Go to: http://ucanr.edu/sites/anrstaff/Divisionwide_Planning/2014_Call_for_Positions/, follow the instructions, scan down the page until you find the positions of interest, click on the position, then add your thoughts in the comment box and click "save comment". **The public comment period is open through July 21, 2014.**

Once again, thanks for a wonderful career, great support, and the super relationships with the individuals and industries I've served. I plan to stay in Chico so I will hope to see you at field days and research conferences in the future. Best wishes to you always!

Leaf analysis and salinity monitoring

Joe Connell, UCCE Farm Advisor, Butte County

Leaf analysis for the full range of nutrients is best done in July when nutrient levels in leaf tissue are stabilized. Published July critical values established for almond by U.C. researchers can help guide you in your fertilization practice. Analysis can reveal specific nutrient deficiencies or can alert you to developing trends when results are compared from one year to another. Keeping trees in the adequate zone for nitrogen can save on fertilizer costs by helping to avoid over fertilization.

Excessive amounts of chloride, sodium and possibly boron, depending upon location, should be monitored if water quality is poor and/or chloride is a component of the fertilizers frequently used in the orchard. With this year's drought conditions and changing water sources pay particular attention to these potentially damaging elements when selecting analyses from the lab. Hull samples at harvest are the most sensitive test for orchard boron status.

Leaf nutrient levels change through the growing season. Concentrations of nitrogen, phosphorus, and zinc on a leaf dry-weight basis start very high early in the season and decline rapidly to a fairly steady state after mid-June, levels plateau and then drop off again from September to leaf fall. Potassium starts high in the spring then decreases reaching a plateau about the same time as nitrogen, phosphorus and zinc. Concentrations of magnesium, manganese, boron and chloride remain fairly constant or increase slightly during the season. Boron, chloride, and sodium however, will increase steadily if excess amounts are present in the soil or water. Calcium is the one element that always starts low and increases steadily over the season as the leaves age.

Most laboratories group these nutrients together in one easily requested analysis. Note that if micronutrients have been applied in a foliar spray (including fungicides such as ziram, Manzate, and/or Ph-D), contaminated leaves will show excessively high levels of those nutrients and the reported levels should be disregarded.

The new protocol for April leaf analysis is used to give an advance estimate of only July nitrogen levels that can be compared to the July critical value by entering the April nutrient level results into the Nitrogen estimating program. There are no standards for critical values in April for any of the nutrient levels.

When comparing lab results from one year to the next, or for an April and July sampling, it is important to consistently use the same sampling methods. The following methods should be followed:

- Sample uniform, representative trees across the block at least 90 feet apart.
- To overcome tree to tree variability, collect a representative sample from a minimum of 18 to 28 trees.
- From each tree, collect all the leaves from 5 to 8 well exposed, non-fruiting spurs around the canopy located between 5 and 7 feet from the ground.
- A minimum of 100 leaves per sample should be combined in a single paper bag for analysis.

Leaves selected for analysis should be free of obvious tip burn, insect or disease injury, mechanical damage, etc., and should be from normal, healthy trees. If you have a weak area and you'd like to diagnose the problem, sample that area and compare the results with those of a sample from your best area to see if tree nutrition might be involved.

Deficiencies that are most common in this area are nitrogen, potassium, and zinc. Zinc deficiency is most common in sandy or high pH soils and old barnyard locations and is easily identified in the field from leaf symptoms early in the season. Boron deficiency is more prevalent on sandy soils or on soils

near the foothills. Manganese and iron deficiencies are sometimes seen on high pH soils or where soils are too wet or have areas with high water tables. Useful critical values are not established for iron or sulfur levels in almond leaf tissue.

Critical values for July leaf samples are shown in Table 1. Keep the results with your fertilizer application and yield records to better evaluate and estimate future fertilization needs. For more information on nutrient deficiencies and toxicities, sampling procedures, and critical values, see Chapter 26 in the Almond Production Manual, Publication 3364.

Remember, leaf analysis is only a helpful guide in orchard management. Leaf levels should be considered along with orchard appearance and growth before corrective action is taken. Visual observation is an excellent complement to any lab analysis. Make sure that a deficient element is really the problem before you seek fertilizer applications as a solution.

Table 1. Critical nutrient levels for almond leaves*sampled in July (Almond Production Manual; UC ANR Pub. 3364).

Nutrient	Deficient	Adequate	Excessive over
Nitrogen (N)	< 2.0%	2.2-2.5%	> 2.7%
Phosphorous (P)		0.1-0.3%	
Potassium (K)	< 1.0%	> 1.4%	
Calcium (Ca)		> 2.0%	
Zinc (Zn)	< 15 ppm		
Manganese (Mn)		> 20 ppm	
Copper (Cu)		> 4 ppm	
Magnesium (Mg)		> 0.25%	
Sodium (Na)			> 0.25%
Chlorine (Cl)			> 0.3%
Boron (B)	< 30 ppm	30-65 ppm	> 300 ppm
**B Hull levels		>80 ppm	

* Fully expanded leaves from non-bearing spurs sampled in July.
** Use analysis results of hulls sampled at harvest to best assess almond boron status.

Research reveals the core components of optimum almond production.

Franz Niederholzer, UCCE Farm Advisor-Colusa & Sutter/Yuba Counties
Bruce Lampinen UCCE Specialist – UC Davis Plant Sciences Department

Almond growing has changed over the past several decades. Average kernel yield per acre has more than doubled between 1980 and today. Successful growers produce huge crops that were unheard of in previous generations. Producing these high yields means an increased level of management on all fronts – irrigation, pest management, nutrition, labor, equipment, etc. With so many tasks facing growers, knowing what is at the heart of almond production is essential to maintaining high yield.

To help growers focus on the core components of almond production and maximize sustainable yield, University of California researchers conducted detailed field research over the past several decades. Bottom-line conclusions drawn from their work are straight forward: Grow the trees to intercept 80% of the sunlight falling on the orchard and keep the leaves on the tree throughout the growing season. Of particular importance this time of year is irrigation management during and after harvest when ET is still high -- in August and September.

Almond leaves make carbohydrates out of sunlight and CO_2, and these carbohydrates drive tree and crop growth. There is a limit to how much carbohydrate can be made per square inch of leaf, so more leaves drive more production – to a point. In an orchard with over 80% light interception, insufficient sunlight energy reaches the orchard floor to dry nuts quickly resulting in an increased risk of microbial contamination (*Salmonella*, etc.). Growers must balance variety and rootstock selection with local soil type and nutrient and water inputs to grow the canopy to 80% interception.

Once trees fill their space, there is no room to coast, no letup in management. A full, healthy canopy must be maintained from year to year. Maximizing sustainable almond yield means maximizing flower numbers and nut set every year. Nuts are primarily borne on spurs, spurs are more likely to flower the greater their leaf area the previous year. [Research shows that spurs growing in more sunlight develop greater leaf area than more shaded spurs.] Thus, building and maintaining leaf area, particularly spur leaf area, throughout each season is vital to high yield potential next year. Achieving this goal is made more challenging by the fact that almost all almond spurs (92% in a recent study) do not produce flowers the year after bearing nuts. In addition, as many as 20-25% of bearing spurs in a given year – particularly those in shaded locations in the canopy – die after harvest. Shoot growth provides new bearing surface to replace that lost to shading. All this means growers must continually grow two crops in a year – the current nut crop and a healthy vegetative "crop" of non-bearing spurs and new shoots that will bear and support the crop in future years.

Maintaining a strong population of non-bearing spurs requires focus on the obvious and the subtle. *Significant leaf loss from July through September from a range of causes (spider mites, rust, alternaria, scab, drought, etc.) will significantly reduce the number of flower buds formed this year and therefore can dramatically reduce nut yield next year*. Less dramatic, but economically significant yield loss has been linked to modest leaf loss following water stress at harvest.

Spur growth and bearing surface renewal occurs early in the growing season, driven primarily by carbohydrates captured the previous year and stored overwinter in woody tissue. *Late summer leaf loss – even as little as 10% reduction in light interception -- can significantly reduce carbohydrate storage overwinter. Reduced carbohydrate storage can limit spur growth after bloom, thus reducing bearing surface and yield several years later*. Per tree yield estimates one to two years after moderate water stress during irrigation cut-off were 10-15% less than fully watered trees in UC research.

Irrigating as soon as possible after shaking – while keeping water off harvested nuts -- is essential to minimizing orchard water stress, keeping leaves on the tree, and thus maintaining high yield in almond orchards. This could be particularly important this year as an early harvest appears likely and this could mean higher temperatures during harvest(s) and more water stress risk (higher ET) during irrigation cut off.

Knowing what is at the core of consistently high, sustainable almond yields is key to successful commercial production. Developing a tree canopy with 80% light interception is accomplished over years. Maintaining that canopy the entire growing season and especially through and after harvest is at the core of delivering consistently high yields once the orchard canopy structure is developed.

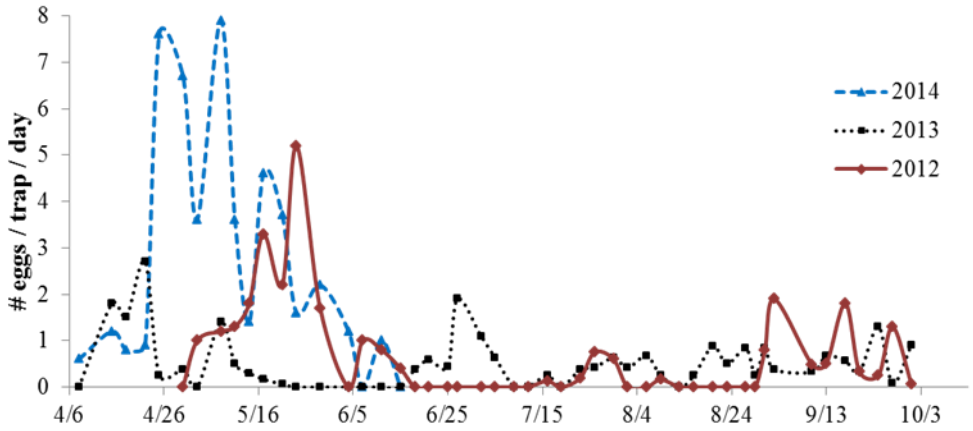
Navel orangeworm management - 2014

Richard P. Buchner – UCCE Farm Advisor- Tehama County.
Danielle M. Lightle- UCCE Farm Advisor- Glenn, Butte and Tehama Counties

Navel orange worm (NOW) monitoring begins in early April by hanging black egg traps baited with almond press cake mixed with 3-10% almond oil. Traps mimic old, moldy mummy nuts attractive to female NOW for egg laying and larval feeding. Because NOW populations are usually low in the Sacramento Valley, we typically do not observe egg laying on every trap, every year. Winter weather and good mummy nut removal (orchard sanitation) practiced in the Sacramento Valley reduce overwintering larvae and decrease worm pressure. Multiple traps are a good strategy to improve the probability of observing egg laying particularly when NOW populations are low. Four traps per location is a reasonable compromise between time and accuracy and reading NOW egg traps twice per week (Monday and Thursday) has worked well. Eggs will be white when first laid and turn orange as they mature. Remember, egg traps alone will not tell you if a spray is necessary, but if used in combination with Degree-Days (DD) it is possible to predict NOW activity and egg hatch.

Egg laying started about four days earlier this year compared to 2013 and the number of eggs and the duration of first flight egg laying was much greater in 2014 compared to the previous two years. Both 2014 and 2013 had biofixes much earlier than 2012. Figure 1 shows a comparison of 2012, 2013 and 2014 NOW egg laying in a Tehama County almond orchard. Hull split is expected to be early so it is important to pay attention and practice an early harvest to avoid as much worm damage as possible. A hull split spray can help reduce damage from this pest but that practice alone will not assure premium quality nuts. Peach Twig Borer (PTB) and Oriental Fruit Moth (OFM) activity may also influence worm pressure this year so keep an eye on those pests as well.

NOW biofix is the beginning date of consistent egg laying. New crop nuts are a more nutritious food source which speeds up generation time after hull split. Generation time is 1056 DD on less nutritious mummy nuts and 723 DD on new crop nuts. Using that information we can predict second and third generation egg laying and egg hatch. The accuracy of the prediction improves as information is collected over the season. If egg hatch coincides with hull split on susceptible varieties, the chance of damage is increased.



2014	Biofix 1 – 4/7			
2013	Biofix 1 – 4/11	Biofix 2 – 6/17	Biofix 3 – 7/18	Biofix 4 – 8/19
2012	Biofix 1 – 5/3	Biofix 2 – 7/23	Biofix 3 – 8/31	

Figure 1. Three years of NOW egg trap history for a single almond orchard in Tehama County. The data are an average of a 4-trap transect through the orchard, set in the same location each year. Notice the earlier egg laying over a longer duration in 2014 compared to previous years.

Assuming that NOW are feeding on less nutritious mummy nuts and the average DD are close to 15 DD per day the NOW degree-day model predicts that second generation egg laying should be observed around 6/17/14. First eggs from the second flight were detected on egg traps on 6/16/14 at the Tehama almond orchard location. Additional NOW trap catch is required to confirm consistent egg laying and that 6/16/14 is really the second biofix. The next event will be the third biofix. Assuming early hull split and a long duration in egg laying, many of these worms will be feeding on new crop nuts and the model would suggest third flight egg laying 723 DD from the second biofix. Assuming 20 DD per day for the end of June and early July that would take about 36 days and predict the third biofix on 7/22/14 and a fourth biofix on 8/27/14. A lot can change over that much time so the egg traps must be used to confirm early predictions. Accuracy will improve with additional information. Hull split may occur the first week in July so watch flight activity and hull split as the 2014 NOW story unfolds.

Keeping an eye on egg traps will continue to allow adjustments or confirmation of these predictions as the season progresses. You can follow the Tehama information by going to http://cetehama.ucdavis.edu then click on orchard crops and click on insect update. Spring or hull split spray applications are two options for reducing damage. Spray timing and material choices are described in detail at the UC IPM website http://www.ipm.ucdavis.edu/PMG/r3300311.html. The NOW degree-day model can be accessed at http://www.ipm.ucdavis.edu/WEATHER/index.html. Select your County, and click on the navel orangeworm model. Choose almonds and continue from there. A rapid, early harvest is the best defense against worm damage and is an essential practice to preserve nut quality and optimum value.

Upcoming Meeting Announcement

NITROGEN MANAGEMENT IN ORCHARD CROPS

THURSDAY, July 24, 2014—1-4 PM
Red Bluff Elks Lodge
355 Gilmore Road, Red Bluff, CA 96080

This workshop will feature Professor Patrick Brown, University of California Davis, Department of Plant Science. Dr. Brown specializes in soil and plant nutrition with a focus on perennial orchard crops. Nitrogen management in orchard systems will be emphasized in this workshop. He will discuss requirements of perennial tree crop systems, application technology and development of productive and environmentally sound fertilizer use. He will present information related to almond, walnut, prune and other tree fruit, nut, and vine crops.

The latter portion of the workshop will foster an interactive exchange among growers and agricultural professionals in the audience and the workshop hosts and speakers. The objective of this session is to apply the research-based knowledge and tools for determining N fertilizer needs and ways of supplying it efficiently. Collectively, we will seek to build upon our working knowledge and tools for N management to support growers who are faced with increasing regulation.

More information about this workshop will be provided as July 24th approaches.