COOPERATIVE EXTENSION ... UNIVERSITY OF CALIFORNIA

"FRUIT AND NUT NOTES"

TEHAMA COUNTY **July 2012** Volume 9

1754 Walnut Street, Red Bluff, CA 96080 Phone (530) 527-3101 Email: rpbuchner@ucdavis.edu

Richard P. Buchner
UC Farm Advisor -Orchard Crops, Tehama County Director

Prepared by Cindy McClain
Office Manager/Ag Secretary

Sacramento Valley Regional ALMOND NEWSLETTER

IN THIS ISSUE:

Alternaria Leaf Spot and Leaf Rust of Almond

Joe Connell, UCCE Farm Advisor, Butte County, and
Jim Adaskaveg, Professor, Department of Plant Pathology and Microbiology, University of California Riverside

Alternaria leaf spot and almond rust are fungal diseases of almond that are becoming more prevalent in the Sacramento Valley. Both diseases are favored by high humidity and leaf wetness. Often, additional fungicide treatments are necessary to minimize early defoliation. Recent extended wet springs and changes in cultural practices (higher density plantings and microsprinkler irrigation with longer, more frequent irrigations) are contributing to higher humidity, more accumulated leaf wetness hours (e.g., dew, rainfall, irrigation, etc.) resulting in higher disease incidence.

Alternaria leaf spot is a fungal disease caused by a complex of Alternaria species including *A. alternata, A. arborescens* and *A. tenuissima.* Alternaria leaf spot appears as up to half inch diameter brown spots (Fig.1) on leaves. Leaf spots turn black as the fungus produces spores. Alternaria leaf spot develops most rapidly in the hot summer months, and can almost completely defoliate trees by mid-summer.

Disease management. Relying entirely on fungicides to control this disease can be costly and increases the risk of resistance development. Consider an integrated approach including:

- Planting less susceptible cultivars. Varieties most susceptible include Carmel, Sonora, Monterey, Winters, and Butte.
- Select a planting design which allows for air circulation. Orchards planted with rows in an east/west direction typically have more severe disease than orchards with rows in a north/south orientation.
- Prune and train trees to allow air circulation and reduce dew formation.
- Practice good foliar disease and mite control to minimize stressed and injured leaf tissue.
- Irrigate less frequently with larger volumes of water to minimize relative humidity and subsequent leaf wetness.
- Manage the orchard floor to reduce relative humidity and the amount of senescing tissue colonized by *Alternaria* species.

Disease resistance against QoIs (strobilurins – FRAC group 11) and SDHIs (FRAC group 7) occurs in the Sacramento Valley. Late-spring/early-summer applications should alternate materials to manage resistance. New materials (Quash, Inspire Super - both containing FRAC group 3) and Ph-D (FRAC group 19) must be used in rotations and mixtures for resistance management. Newer SDHI fungicides (different sub-groups) are proving to be highly effective but the potential for resistance is also extremely high. Combination tank mixtures, pre-mixtures, and rotations will be required for preventing disease resistance to the newer SDHI compounds.

Rust is caused by the fungus *Tranzschelia discolor* and occurs sporadically throughout almond-growing areas in California. It appears as small, yellow, angular spots on the upper surface of leaves and rusty red pustules of spores on the lower surface (Fig. 2). The disease is favored by spring and early summer rains and is more likely to become serious in orchards near rivers or streams or other locations where spring and summer humidity is relatively high. Excessive levels of nitrogen are also known to increase a tree's susceptibility. The disease causes premature defoliation and will weaken trees, reducing the following year's bloom. The rust fungus overwinters in infected leaves that remain on the tree, spores contaminating buds and tree bark, and possibly infected twigs. Rust is frequently more severe in young vigorous trees, especially in second to fourth leaf orchards where fungicides have not been applied.

In orchards with a history of rust, treatments should be applied before symptoms appear: 5 weeks after petal fall and and a second application 4 to 5 weeks later to control leaf infections. Two or three applications may be needed in orchards that have had severe rust problems.

A zinc nutritional spray (zinc sulfate 20-40 lb/acre) applied in late October to early November resulting in defoliation may reduce overwintering rust inoculum.

Fig. 1. Alternaria Leaf Spot

Resistance management will be critical to maintain efficacy of currently available fungicides**.** Resistance development in *Alternaria* species to QoI fungicides was first detected in 2003/04. Field Disease resistance was found in Kern County in 2005 and in northern California in 2007. Field disease resistance to SDHI fungicides (group 7) was found in the northern and southern Central Valley in 2007. Consequently, Pristine® (groups 7/11 or QoI + SDHI) is not effective in some locations. For rust, resistance has not been detected and the potential for resistance against QoI (group 7 or QoI) and DMI (group 3) fungicides is considered low.

Fig. 2. Almond Leaf Rust

The following are general suggestions for fungicide resistance management.

- Rotate and mix fungicides that belong to different FRAC group numbers.
- Apply per acre label rates, no every-other-row spraying (upper label rates for QoIs).
- Limit a single mode of action fungicide class (e.g. FRAC Group) application to 1 or 2 per orchard per season.
- Start your fungicide program with a multi-site mode of action material (Captan, Bravo/Echo, Ziram, Rovral, sulfur). Sulfur can be used in combination with single-site mode of action fungicides such as QoI and DMI fungicides.

Fungicides effective for Alternaria leaf spot and rust can be found at www.ipm.ucdavis.edu Click on Agricultural Pests, then Almond, and then the individual diseases. Another resource is the 2012 Efficacy and Timing of Fungicides Publication at http://ipm.ucdavis.edu/PDF/PMG/fungicideefficacytiming.pdf

Advisor Retirement and New Position Proposals

Bill Krueger UCCE Farm Advisor Glenn County

On June 28th I retired after 32 years as a University of California Farm Advisor. I started as a Tree Crop Advisor in Glenn County in August of 1980. Over the years I added Olives in Tehama County and County Director in Glenn County to my responsibilities. I have seen tree crop acreage in Glenn County grow from 22,000 acres to more than 68,000 as many acres of row crops and, more recently, rangeland was converted to tree crop production. It has been great to be involved with this and I appreciate all of the support and cooperation I have received from growers, allied industry and my colleagues over the years.

During the same time we have also seen UCCE ranks decline from around 500 to less than 200 now. Within the current Advisor ranks two thirds are 55 or older so there are many more retirements eminent. While the consolidation of UCCE resources is likely to continue UCANR Administrators put the hiring of new Advisors and Specialists as a highest priority.

There are currently 107 proposed positions being considered for administrative approval to recruit. From this group of 56 Specialists and 51 Advisors a small number will be selected for recruitment. Four of the proposed positions could be of real benefit to the Northern Sacramento Valley. They are, an Orchard Systems Advisor #079 focused primarily on Walnuts and Prunes housed in Butte County covering Butte and Glenn Counties now and, potentially, adding Tehama County in the future when the current Advisor retires; an Area IPM Advisor Sacramento Valley # 211; a Sustainable Orchard Systems Advisor for Almonds and Olives #235 to be housed in Glenn County and covering Glenn and Tehama Counties now and potentially adding Butte County when the current Advisor retires; and a Small Farms Local Food Systems Advisor #104 to be housed in Butte County covering Butte, Glenn, and Tehama Counties.

To learn more about these or the other positions being requested, and, to comment or make suggestions, they are posted online and are open for comments through August 7th. Following is the link to the UC ANR website so you can comment on Farm Advisor and Specialist positions that will affect UC Cooperative Extension activities in the northern Sacramento Valley: http://ucanr.org/sites/anrstaff/Divisionwide_Planning/Program_Planning_and_Evaluation/2012_Call_for_Supplemental_Positions/ (hold down the control key and click on the link to make the link work).

Once you are on the website, the position descriptions will appear when you click on the position. You can also see the proposed positions from throughout the State on the website and see comments that have been made so far. You can make a comment by clicking on the number of comments on the website next to the position (if the number is 0 there are no comments so far). Thanks for your support for our UC Cooperative Extension programs in the Sacramento Valley.

Why are some individual trees turning yellow, are weak, or are not growing?

Joe Connell, UCCE Farm Advisor, Butte County

When an individual tree turns yellow compared to all of its neighbors it often indicates there is something going wrong in the root system. The yellowing often shows up at the time the weather turns hot and the compromised roots are unable to keep up with the water needs of the tree. There are a variety of potential causes for these symptoms and they can't all be fully explored here but I'll comment on some of the main things I see on farm calls.

Soil borne diseases. The two most common diseases affecting the crown and root system are *Phytophthora* and *Armillaria*. Both diseases cause similar above ground symptoms: poor terminal growth, small chlorotic leaves, premature defoliation, and decreased productivity, branch dieback and ultimately, tree death.

For *Phytophthora*, disease severity depends upon *Phytophthora* species, soil type, climatic conditions and tree age. *Phytophthora* affects the inner bark and cambium and typical root or crown cankers will be brownish with a fairly distinct margin as the fungus advances. Removal of the outer bark often reveals brown tissue with a water soaked zonate appearance near the margin between healthy white and infected tissues if the fungus is active. Excessive soil moisture favors infection.

Armillaria mellea or oak root fungus is identified by cutting into crown or root tissue and looking for whitish fungal plaques growing between the bark and wood. Whitish fungal strands and gumming are also commonly found in infected bark. Finding rhizomorps, fungus signs that resemble brown to black shoestrings adhering to the outer bark of infected roots is a positive confirmation of *Armillaria*. They develop best in moist soil. *Armillaria* often produces clusters of mushrooms around the base of infected trees following rainfall from November to February. When newly planted in an infected site it usually takes about four years for a susceptible tree to show symptoms of *Armillaria*. Infected trees may die suddenly when the heat of summer arrives.

Another soil borne disease that can weaken trees, crown gall, is caused by the bacterium *Agrobacterium tumefaciens* and is relatively easy to identify. Galls are made up of undifferentiated, disorganized tissue growths on roots and/or the tree crown. Galls most often develop on root or crown tissue underground and may not be noticed. As galls enlarge, the center of the gall dies creating a dead wood area that can be infected by wood rotting fungi. These galls and wood rots were shown to be related to 85% of the trees lost in windstorms in surveys previously conducted in the Chico area. Trees with severe crown gall infection and girdling may be stunted and may display poor growth and yellow foliage. Before almond trees succumb to crown gall itself they often topple over from structural weakening related to the wood rots.

Water logging. One of the more common problems has been water logging injury due to periods of excessive rainfall at times during the past two years. Zinc and manganese micronutrient deficiencies are more prevalent in soil related areas where soils are wet, cold, and saturated. Reduced root activity and nutrient uptake can produce pale leaf color or interveinal chlorosis. When tree roots are excessively wet they can die from lack of oxygen even without any major pathogens present. This may be a transient problem in some cases, affecting only small feeder roots followed by tree recovery as new feeder roots grow out of the problem. In more severe cases, larger roots can die and trees may begin a gradual decline. Such trees may make little new growth, have a canopy that begins to thin out, may be off color, can stress easily between normal irrigations, and may display lower limb dieback. Once tree root systems are injured by excessive rainfall it's easy for the weak orchard areas to be overwatered when irrigating. This compounds the problem making it difficult to overcome. Reducing nozzle sizes in weak areas in an orchard may help mitigate over-irrigation.

Moisture stress. Good irrigation management is required for growth and vigor. Young trees are sensitive to moisture stress and will stop growing at moderate stress levels. Root systems need to be kept moist but not wet enough to favor root rot fungi and/or low oxygen conditions. Pressure chambers are the most effective technique for measuring tree water status. Research suggests young almonds will slow shoot growth at –12 to –13 bars Midday Stem Water Potential. Soil augers are useful for visual soil moisture evaluation and various soil moisture sensors are available.

Vertebrates. Pocket gophers are serious pests especially in young orchards. Root damage results in a yellow, stressed canopy, and poor tree growth. Gopher girdling on the crown mimics *Phytophthora* root rot, oak root fungus, or mild etch when on Marianna 2624 rootstock. Trees die when completely girdled. Gophers can easily kill two to four year old trees but I've seen 10 year old trees girdled and killed by gophers as well. Look for missing bark and parallel tooth marks on the wood at feeding sites about 6 inches below ground where the bark has been chewed away in a girdle about 4 to 6 inches wide. Voles, also called meadow voles or meadow mice, may move into orchards and feed on the bark of young trees at the ground surface particularly when vegetation around tree trunks offers cover and protection. Mainly a problem on first year trees, their girdling produces symptoms similar to gopher damage. Rodents are potential pests in all orchards, but they are more likely to invade orchards that provide good cover with a cover crop or where they can migrate in from rangeland or unmanaged areas.

Rootstock compatibility. Union mild etch (UME) occurs on Marianna 2624 plum rootstock when soils are too wet during the growing season. This problem is more prevalent on the varieties in an orchard that are the least compatible with the rootstock (such as Butte or Monterey) but other varieties may be affected as well. On Marianna 2624, once growth is affected by UME, leaves turn pale yellow and growth may stop. When severely affected, leaves roll and scorch on the margins, and trees may defoliate. Some trees die or remain weak enough to be removed although most affected trees will recover the following year.

New Almond Cost Study for the Sacramento Valley

Carolyn DeBuse, UCCE Farm Advisor, Solano & Yolo Counties

A new almond cost study has been published by UC Davis. The cost study shows sample costs to establish an almond orchard and produce almonds in the Sacramento Valley, for the year 2012, under micro-sprinkler irrigation. This is a great resource and guide if you are thinking about growing almonds for the first time, expanding your current orchards, or just need to determine potential returns. This cost study assumes a hypothetical farm of 105 acres with 100 acres planted in almonds. In the first pages, the study goes over the farm's layout, orchard establishment and cultural practices assumed for the study trying to capture the current practices used to grow almonds. The second part of the study is made up of tables which look at the average current cost of all these practices for the years of orchard establishment and for a mature orchard. Each table finishes with estimated total cash cost and returns per acre grown. A sample table of costs per acre at varying yields is shown below.

UC COOPERATIVE EXTENSION
Table 5. RANGING ANALYSIS
SACRAMENTO VALLEY- 2012

COSTS PER ACRE AT VARYING YIELDS TO PRODUCE ALMONDS

	YIELD (lb/acre)						
	1,600	1,800	2,000	2,200	2,400	2,600	2,800
OPERATING COSTS/ACRE:							
Cultural Cost	1,803	1,803	1,803	1,803	1,803	1,803	1,803
Harvest Cost	421	472	523	574	625	676	726
Interest on operating capital @ 5.75%	33	33	34	34	34	34	35
TOTAL OPERATING COSTS/ACRE	2,258	2,309	2,360	2,411	2,462	2,513	2,564
TOTAL OPERATING COSTS/LB	1.41	1.28	1.18	1.10	1.03	0.97	0.92
CASH Overhead Costs/ACRE	355	355	355	355	355	355	355
TOTAL CASH COSTS/ACRE	2,613	2,664	2,715	2,766	2,817	2,868	2,919
TOTAL CASH COSTS/LB	1.63	1.48	1.36	1.26	1.17	1.10	1.04
NON-CASH Overhead Costs/ACRE	885	885	885	885	885	885	885
TOTAL COSTS/ACRE	3,498	3,549	3,600	3,651	3,702	3,753	3,804
TOTAL COSTS/LB	2.19	1.97	1.80	1.66	1.54	1.44	1.36

Table showing the cost per acre at varying yields to produce almonds taken from the new Almond Cost Study for Sacramento Valley (micro-sprinklers) 2012.

This cost study is a great tool and should only be used as an estimate of current costs and returns. One way to use the cost study is to use it as an outline and create similar tables using your actual costs. Or another way is for new growers to use them to summarize what practices, machinery, custom hired work, and materials they should be planning to have when they establish their first orchard.

This cost study can be found at http://coststudies.ucdavis.edu/files/AlmondSprinkleSV2012.pdf

All current and past UC cost studies can be found at http://coststudies.ucdavis.edu

Coping with Rain at Harvest

Franz Niederholzer, UCCE Farm Advisor, Colusa/Sutter/Yuba Counties

Rain at harvest can increase risk of mold and concealed damage to nuts. Both of these conditions can reduce grower income. The increase in acreage of late harvested varieties in the Sacramento Valley, especially Fritz and Monterey, increases the risk of rain at harvest. Several key points to remember if rain is forecast or occurs at harvest are:

- If rain is forecast, don't shake. After a rain, wet nuts dry faster on the tree than on the wet orchard floor.
- If rain is forecast and nuts are harvested but too wet to pickup, blow them away from the tree trunks but don't windrow. Rain wetted nuts on the orchard floor often are very difficult to blow as they tend to stick to muddy soil.
- Condition ("Drop chute") windrowed nuts after a rain. Removing leaves and other trash helps the nuts dry faster.

Grower options across a range of harvest conditions appear in the following table.

Protecting the almond harvest from rain. (Table 36.1 Almond Production Manual, UC ANR pub. 3364)

	Prescribed action when 5-day forecast predicts			
Orchard conditions	Dry, windy, or normal weather	High Humidy	Showers	Rain
No rain has occurred, almonds are:				
On tree	Knock	Knock	Knock	Wait
Knocked	Harvest normally	Harvest normally	Open*	Open
Opened and raked	Harvest normally	Harvest normally	When dry, windrow	When dry, windrow
Windrowed	Stockpile or pick up	Stockpile or pick up	Stockpile or pick up	Stockpile or pick up
After 0-¼ in rain, almonds are:				
On tree	Knock	Knock	Wait	Wait
Knocked	Harvest normally	When dry, open	When dry, open	Wait
Opened and raked	Harvest normally	When dry, windrow	When dry, windrow	1.Wait or windrow or 2. Pick up and machine-dry
Windrowed	When dry, pick up	When dry, pick up	1. When dry, pick up or 2. Pick up and machine-dry	1. when dry, pick up or 2. Pick up and machine-dry
After ¼ - ½ in rain, almonds are:				
On tree	Knock	Wait	Wait	Wait
Knocked	Harvest normally	Harvest normally, windrow	Harvest normally	Open
Open and raked	Harvest normally	Harvest normally, windrow	Harvest normally	1. Wait or windrow or 2. Pick up and machine-dry
Windrowed	Drop-Chute[T]	1. Drop-chute or 2. Pick up and machine-dry	1. Drop-chute or 2. Pick up and machine-dry	1. Wait and drop-chute or 2. Pick up and machine-dry
After more than ½ in rain, almonds are:				
On tree	Knock	Wait	Wait	Wait
Knocked	Open	Harvest normally	Harvest normally	Open
Opened and raked	Harvest normally	1. Pick up and move nuts to dry area or 2. Machine-dry	1. Pick up and move nuts to dry area or 2. Machine-dry	1. Pick up and move nuts to dry area or 2. Machine-dry
Windrowed	Drop-chute	1. Pick up and move nuts to dry area or 2. Machine-dry	1. Pick up and move nuts to dry area or 2. Machine-dry	1. Pick up and move nuts to dry area or 2. Machine-dry

Source: This table was originally developed by Larry Reinhart, former manager, North State Hulling Cooperative.
*To open, in this context, is to sweep almonds off berms but not gather them into windrows.
[T] To drop-chute is to run nuts through the pickup machine and drop them from an open cart. This process removes leaves and promotes quick drying by laying out a wide swath of almonds. This process is also known as "Conditioning" nuts.

2012 Navel Orangeworm

Richard P. Buchner – UCCE Farm Advisor, Tehama County

Navel orangeworm (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. ***Figure 1*** shows 2012 NOW egg laying in a Tehama County almond orchard.

NOW biofix is the beginning date of a consistent increase in egg laying. Notice that 5/3/12 is the biofix for the Tehama county orchard (*figure1*). New crop nuts are a more nutritious food source which speeds up generation time. 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 hatch. The accuracy of that prediction will improve as more information is collected. If egg hatch coincides with hull split on susceptible varieties, the chance of damage is increased. ***Figure 2*** shows actual and predicted generation events for one almond orchard in Tehama County. Since hullsplit is beginning in some orchards, a portion of the second generation may be able to feed on new crop nuts and will develop more quickly. With our current information, the earliest third generation laying could be expected to begin is 8/14/12 with egg hatch expected on 8/19/12. Additional data will adjust that prediction. You can follow the Tehama information by going to cetehama.ucdavis.edu then click on orchard crops and click on insect update. Spring or hull split applications are two options for spray control. Spray timing and material choices are described in detail at the UC IPM website http://www.ipm.ucdavis.edu. Click on Ag Pests, Almond, then navel orangeworm.

Tehama County 2012 Navel Orangeworm Monitoring

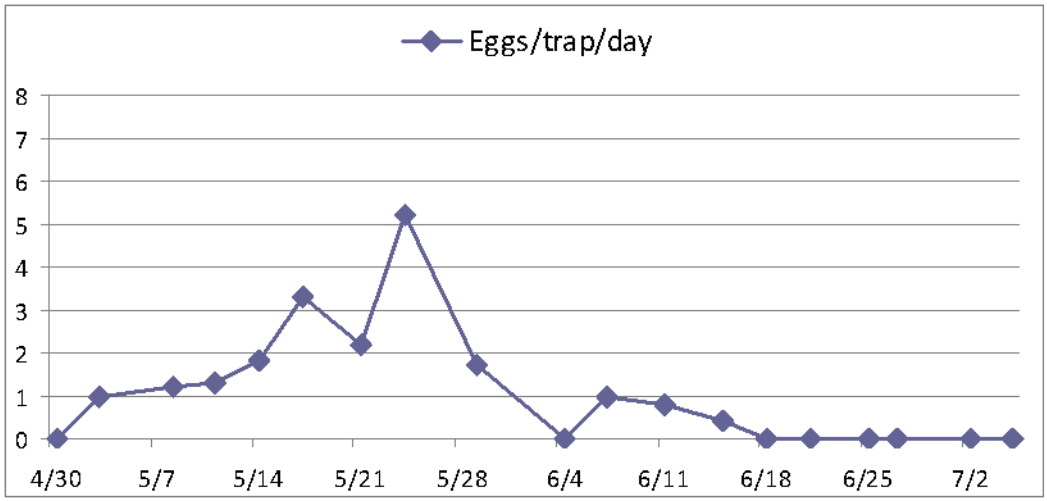

Figure 1. Egg laying activity for Navel Orangeworm in a single almond orchard in Tehama County. 5/3/12 was selected as the first biofix and the beginning of the first generation.

2012 NOW Generation Activity

Biofix, start of 1st generation	1st Gen insect activity	Biofix, start of 2nd gen.	2nd Gen insect activity	Biofix for 3rd gen.	3rd gen. insect activity
1st eggs, Tehama Co.	1st egg hatch on mummies	Egg laying on mummies OR on new crop after hull split	Second egg hatch	Egg laying if moth developed on new crop	Egg hatch, nut feeding
Actual 5/3/12	Actual 5/9/12	Predicted 7/9/12	Predicted 7/14/12	Predicted 8/14/12	Predicted 8/19/12
0 DD	100 DD	1056 DD	100 DD	723 DD	823 DD

Figure 2. Actual and predicted NOW activity for Tehama county almonds. Generation length is 1056 Degree Days on mummy nuts, 723 Degree Days new crop nuts and 100 Degree Days for egg hatch. Notice that Degree Day accumulations reset to zero at each actual biofix.

Tehama County Fruit & Nut Notes & Sacramento Valley Regional

ALMOND NEWSLETTER

Cooperative Extension
University of California
1754Walnut Street
Red Bluff, CA 96080
"52"

PRSRT STD
US POSTAGE
Paid
Red Bluff
Permit No. 112