

Fall Nutrition in Almond Orchards

Plant nutrient levels are important in order to maintain high yields. Nitrogen should not be added in late fall or winter due to leaching and loss. Potassium, foliar-applied zinc, and boron, however, should be added if needed. Zinc sulphate can play an important role in breaking the disease cycle of rust and shot hole when applied as a foliar spray in November. These fungal diseases can remain on older leaves through the winter and be an inoculum source that infects new leaves in the spring. Young vigorous orchards often become zinc deficient due to their excessive growth and development. Zinc deficiency symptoms often appear in late summer and are referred to as 'little leaf' or 'rosette' and are characterized by a shortening of the internodes toward the tips of the shoots and small narrow leaves. Often leaves are bent upward on either side of the midrib. Zinc foliar sprays are often applied in the fall to correct deficiency, either as zinc sulfate (neutral zinc 52%) or in a chelated form. I personally don't like waiting so late in the season that the sprayer blows most of the leaves off during the application. I often make my zinc applications in mid October in order to make sure the leaves "burn" from the zinc. There is environmental concern that continued zinc sulfate sprays (10-15 pounds of zinc sulfate in 100 gallons of water) will lead to soil contamination issues, so you might consider more frequent zinc chelated applications during the season. Chelated zinc sprays can be applied safely at anytime during the season when other applications are being made. Zinc can also be applied through micro-irrigation during the growing season in a chelated form, although soil uptake is decreased if soil pH is too high (>7.5).

Many growers apply too much nitrogen and not enough potassium or boron, especially if you are irrigating with water from an irrigation district. Boron nutrition often goes unnoticed and should be monitored with hull samples at harvest. If hull samples are less than 80 ppm boron (B) your trees could be deficient and you may be experiencing a yield loss as a result. Boron can be applied to the soil, in herbicide mixes, or in foliar applica-

tions. Soil applications can be applied (not in a band like potassium) at rates of 2 to 4 pounds of actual boron per acre (10 to 20 pounds of 21% product). Granular boron can be broadcast on the soil while soluble boron formulations can be injected into micro-irrigation systems.

I have observed potassium deficiency in young vigorous second generation orchards. In many of these cases the first generation orchard probably had plenty of potassium stored in the soil and the grower didn't observe deficiency symptoms and didn't apply potassium. But that first generation orchard probably used up most of the available potassium in the soil, and when the 2nd generation orchard is planted--potassium becomes limiting. Potassium deficiency symptoms can become visible in second generation orchards and growers may end up applying as much potassium as nitrogen. Young, vigorous growing orchards often display symptoms in late spring to early summer on leaves of new shoots. Leaves can turn pale and develop marginal necrosis and roll into a boat shape or the classic 'Viking's prow' symptom. The 'Viking's prow' symptom typically shows first in the tops of trees and later throughout the whole tree. As potassium deficiency progresses, fruit bearing spurs often die and spur renewal is reduced. The current crop is not affected but future yields are reduced, making the correlation between potassium deficiency symptoms and reduced yields difficult in a single year. Butte is a good indicator variety of potassium deficiency, displaying symptoms while other varieties do not. Recovery from potassium deficiency is a long-term process--once you see leaf symptoms the trees are already deficient and you may experience yield loss before you can correct the problem. Leaf analysis should be performed annually in July to prevent symptom development. The current UC recommendation is to keep leaf potassium levels at or above 1.4 % in July-sampled leaves.

An almond tree in production uses as much potassium as nitrogen, and similar to nitrogen, ten pounds of potassium are needed for every 100 pounds of nutmeats. Thus, a 2000-pound per acre crop will need approximately 200 pounds of potassium to replace the potas-

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sium that was removed in the crop. Potassium is released slowly in the soil and not readily leached.

Because the potassium ion (K⁺) is positively charged it can easily be bound with negatively charged clay particles and become unavailable to the tree. For this reason, we typically apply potassium sulfate in bands next to the tree rather than broadcasting. Potassium sulfate is preferred over potassium chloride because of salt accumulation in the soil. Research has demonstrated that annual fall applications of 500 lbs per acre of banded potassium sulfate would maintain potassium levels. Two thousand pounds per acre of potassium sulfate can correct a deficiency for 4 or more years—but it's expensive. In clay soils, double-concentrated bands may be necessary. You may also wish to apply gypsum, calcium sulfate, as a band over the top of previous potassium bands. The calcium ions (Ca⁺⁺) will displace potassium bound to clay particles, making more potassium available while also improving water penetration.

Liquid potassium fertilizers can be applied effectively in-season through your irrigation system. Drip systems are probably better for potassium applications than micro-sprinkler because the amount of K⁺ per wetted area is higher and as a result, potassium will penetrate further into the root zone and be more available. But liquid potassium is generally more expensive and you may not apply as much potassium per acre compared to banding potassium sulfate. Avoid applications that spread potassium applications over a large soil area because it will become bound to the soil and unavailable to the tree. Foliar in-season potassium sprays can alleviate symptoms more quickly, but are relatively expensive and their effect is short-lived.

One of my favorite methods of applying potassium is through compost. While working with organic almond growers I came to appreciate the benefits of compost. Organic almond growers typically apply 10 tons of compost per year in order to get their desired 200 units of nitrogen per acre (assuming 1.0 % nitrogen in the compost). But when growers purchase compost they get a lot more than just nitrogen. Compost typically has more potassium (2.75% in one example from New Era) than nitrogen. Compost will also typically contain 1.45 % phosphorus, 2.6 % calcium, 0.5 % sulfur, 1.16 % magnesium, and 30.2 % organic matter. Our San Joaquin Valley soils are typically very low in organic matter, which is a critical component of many nutrient cycles, especially the nitrogen cycle. If you can increase your soil's organic matter you can increase soil fertility.

Deficiencies in iron (Fe) and manganese (Mn) are relatively rare in San Joaquin County but can be observed in orchards with high soil pH (>7.5), in calcareous soils, or in heavy, poorly drained soils. Both iron and manganese are important in chlorophyll formation so a deficiency in either will show an interveinal chlorosis in young leaves. Iron chlorosis will often leave the small veins green with

interveinal yellowing, or if more severe, will uniformly yellow the leaf. Iron deficiency may show early in the season as leaves yellow and drop, then gradually disappear as soils warm up and dry out. Leaf analysis is not a reliable indicator of iron deficiency. The best approach is to recognize leaf symptoms. Manganese interveinal chlorosis will be blotchy or mottled producing a herring bone pattern with major veins green between yellow interveinal areas. Manganese is adequate when July leaf analysis is over 20 ppm. Manganese deficiency can be corrected with foliar sprays of manganese sulfate at 2 pounds per 100 gallons of water. If you have a small problem area, banded soil applications of manganese sulfate at 10 pounds per tree have been effective for longer-term correction. If deficiencies symptoms are observed, one of your first steps should be to have your irrigation water and soil tested to see if the pH is too high. If that is the case, a remedy may be to band elemental sulfur or chisel sulfuric acid about 3-4 feet from the tree row creating an area of lower pH where the trees can pick up these nutrients. Another approach would be lower the pH of the irrigation water by injecting sulfuric acid, which in turn will lower the pH of the soil improving iron, manganese, and zinc uptake. Cold soil temperatures and water logged soil conditions can create a temporary situation which reduces uptake of all three of these micronutrients.

Brent Holtz, Pomology Advisor and County Director

Processing Tomatoes: Local Evaluation of Full-season Varieties

Although this summer's milder temperatures reduced stress to tomato vines and allowed for good fruit set, the season still had its share of serious challenges. The season began and ended with wet conditions which resulted in some disease outbreaks (bacterial speck and bacterial canker in the spring and early summer, and black mold fruit rot in the fall). Furthermore, there was an above-average incidence of vine decline this season. And while in some cases there was a clear causal agent (e.g. Fusarium crown and root rot and Fusarium wilt were major ones), in many other cases the cause of the decline was less clear. And while work is being done to investigate vine decline, it is unlikely that a cultural or chemical solution will be easily found. In the not too distant future we hope we will be able to rely on genetic tolerance to vine decline.

Despite the challenges, statewide yields were once again up, continuing an upward trend due in part to improved varieties. This year, our local mid-maturity processing tomato variety trial was located near Banta (southeast of Tracy) in a drip-irrigated field. The trial was transplanted on May 3rd, and machine harvested on October 1st (151 days). The field was significantly affected by tomato spotted wilt virus (TSWV). Additionally, early-season pressure

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from bacterial speck caused a substantial slow-down in early growth. Despite these diseases, average yield of replicated varieties was over 59 tons per acre although soluble solids overall were quite low, with only SUN 6366 and AB 0311 breaking 5.0 °Bx. The top-yielding variety was H 5508, followed by N 6385, H 5608, BQ 163 and H 3402. Note that the top three varieties for yield all have resistance to tomato spotted wilt virus, perhaps reflecting an advantage of TSWV resistance at this particular location.

Many thanks to our grower cooperator, Hal Robertson / K & H Farms, and to the California Tomato Research Institute and the participating seed companies for their financial support.

Later in the winter, the full UC Statewide Variety Evaluation Report with combined results of all eight trials will be available from the UCD Vegetable Research and Information Center website (or I can mail you a copy):

http://vric.ucdavis.edu/veg_info_crop/tomato.htm

Brenna Aegerter, Vegetable Crops Advisor

Variety	Yield (tons/acre)	Soluble solids (° Bx)	pH	PTAB color	Disease resistance
H 5508	77.39 a	4.13 i	4.44 cd	23.0 cd	VFFN Sw
N 6385	69.72 b	4.45 gh	4.47 abc	22.5 cd	VFFNP Sw
H 5608	68.53 b	4.40 hi	4.53 a	21.0 e	VFFNP Sw
BQ 163	66.43 bc	4.80 cdef	4.45 bc	22.75 cd	VFFNP
H 3402	65.94 bc	4.60 efgh	4.53 a	22.25 de	VFFNP
HM 9905	62.51 cd	4.98 bc	4.51 ab	24.75 ab	VFFN
H 7709	61.40 cd	4.70 cdefg	4.46 bc	23.25 cd	VFFNP
AB 0311	58.83 de	5.13 ab	4.28 f	23.5 bcd	VFFNP Sw
UG 19006	58.55 de	4.58 fgh	4.38 de	23.5 bcd	VFFNP
N 6394	58.22 de	4.68 defgh	4.51 ab	23.25 cd	VFFNP Sw
H 9780	54.63 ef	4.73 cdefg	4.38 de	23.75 bc	VFFNP
BQ 205	54.06 ef	4.90 bcd	4.37 de	24.75 ab	VFFNP
UG 19406	50.38 fg	4.78 cdef	4.36 e	23.75 bc	VFFNP
SUN 6366	46.96 g	5.35 a	4.49 abc	26.0 a	VFFNP
AB 3	46.36 g	4.95 bcd	4.43 cd	23.75 bc	VFFNP
AB 2	46.14 g	4.88 bcde	4.38 de	25.25 a	VFFP
mean	59.13	4.75	4.43	23.56	
CV	7.07%	4.17%	1.07%	4.29%	

Values represent the mean of four observations. Means in the same column followed by the same letter are considered to be statistically similar according to Fisher's Protected Least Significant Difference Test (P = 0.05).

OBSERVATIONAL (single plot)

N 6398	79.45	4.4	4.43	22	VFFNP Sw
N 6404	60.29	4.7	4.41	25	VFFNP Sw
HMX 1890	57.85	4.7	4.50	22	VFFNP Sw
N 6402	56.45	4.7	4.42	23	VFFNP Sw
HMX 9903	53.14	4.9	4.55	21	VFFN
UG 19306	52.40	4.5	4.43	23	VFFNP
HMX 1885	52.34	4.7	4.36	21	VFFNP Sw
DRI 0319	51.14	5.2	4.34	24	VFFNP Sw
BQ 265	49.14	5.1	4.34	26	VFFNP
HMX 1884	40.42	4.7	4.47	22	VFFNP
C 299	38.77	5.3	4.36	24	VFFNP
C 298	33.19	5.1	4.51	24	VFFNP
BQ 186	30.93	5.9	4.50	27	VFFFNP
mean	50.42	4.92	4.43	23.4	

Disease resistances: V = Verticillium wilt race 1; F = Fusarium wilt races 1, 2 or 3; N = Root knot nematode; P = Bacterial speck race 0; Sw = Tomato spotted wilt virus.

In The Vineyard

Weather, Harvest, Invasive Pests, Weeds,
Fall Check List

The 2011 season is wrapping up about on schedule compared to the long-term average, but it has been a challenge to growers across varieties and throughout the county. Even though harvest began about 15 to 18 days later than average, most vineyards will be finished harvesting the last weekend of October. As of mid-October, about 95% of the vineyard acreage is delivered and in the wineries. There are only a few late locations of late varieties such as Cabernet Sauvignon, Petit Verdot, Touriga, Souzao and Lagrein, among a few other "newcomers." This year as in 2010, fruit quality appears to be excellent with good colors, nice flavors, and higher total acids/ lower pH. And as a repeat to last year, there is the double edged sword of a light crop where many individual growers sacrifice income, but winery storage tanks are not at full capacity.

The one caveat is that quality was consistently excellent before the early October rain; after the rain, there was sugar and acid dilution, minor problems of rot and some fruit breakdown where immediate harvest was not possible. So that quality is still very good overall, but a little more mixed by variety and site. For the third year in a row significant rainfall in early October created a seasonal divide at harvest. In 2009 there was the "Big One" when 3 inches of rain fell in two days with 40 mph winds (and lots of trellis damage). Last year in 2010, a big rain finished up much of the harvest in mid October and for 2011 a more modest but substantial rain in the first week definitely caused problems, although no major disasters. What seemed to happen is before the rains for all the early varieties including most whites and Zinfandel for both red and white, the quality was consistently high, with good acids and low pH. After the rain, for many mid-season and late varieties, the quality was definitely mixed. There was some rot and breakdown as sugars rebounded, acids declined and wrap up harvests occurred. The 2011 season is overall a good one, but with a little more mixed results as to quality, compared to recent vintages. Yields were surprisingly low for the second year and hard to explain. Usually a light harvest is followed by a normal or even bumper crop, but this year we learned there are some things to be learned yet.

Seasonal growing degree days (GDD) ended with a total almost exact to last year's summation, which was the fifth coolest year in the last 30 years. Overall conditions were conducive to powdery mildew, but there were enough "washing" rains and very cool temperatures, so that problems were scattered and light where normal control programs were followed. Growing conditions seemed to delay and reduce stress on vines and might have been part of the reason mite problems appeared late, scattered and relatively light, although individual sites did experience some problems. Compared to last year, there was more summer (sour) bunch rot this season, in tight clus-

tered and thin skinned varieties such as Zinfandel and Petite Sirah. Some Botrytis began early in varieties such as Chardonnay, but dry winds helped stop development. After the October rain, some of these dormant infections flared.

As harvest continued and accelerated, fall weather remained dry and warm. This helped to catch up most varieties and vineyards fairly close to average harvest dates. The October 4th and 5th rains amounted to about 1.1 inches, which delayed harvest, caused some problems and forced a quick finish to the 2011 season.

Although yields were down, another vintage year of good color, flavors and total acid levels was seen. The cool year was evident in vine growth and fruit development, as only 2 days above 100°F occurred compared to 5 days last year, 13 days in 2009 and compared to a long term average of about 19 days for an "average" season.

The 2011 season began with above-average rainfall. The last rain occurred on June 5th for a seasonal total of 25.9 inches; compared to 19.2 inches last year, 15.1 inches in 2009, 13.6 in 2008, and 12.1 in 2007. From mid-July on, most daily maximums were below average, but even when daytime maximums were average or higher, the night time lows consistently were at or just below average lows each morning.

Vine mealy bug is still spreading throughout the county, more slowly now that it seems there are good materials for control and most growers are adjusting spray programs to prevent problems; as an ongoing cost of production. It is good to remain on the lookout and aware of any new infestations, often indicated by sooty mold or excessive honeydew in clusters, spurs, or cordons. A high degree of ant activity in and around vines can also indicate problem spots. Good places to begin looking before harvest are where birds tend to roost. The good news is no further European grapevine moths (EGVM) have been trapped and the quarantine may be officially lifted before the end of the year. Unfortunately, invasive species continue to cause problems as light brown apple moth (LBAM) spreads throughout the state and the county; oriental fruit fly (OFF) was discovered in Stockton and while affecting fresh fruit growers more directly, OFF may be of concern both in control and compliance for wine growers.

Increased reports of weed resistance, makes it more important than ever to monitor and to control some of the more noxious and troublesome weeds BEFORE THEY SEED. Besides mare's tail and fleabane, starthistle is also more of a problem along roadsides and it requires attention or it will dominate mowed areas, row middles and habitats.

With a second short crop and sales still increasing, if slowly, demand for many varieties such as Pinot grigio, Petite Sirah, Sauvignon blanc, Zinfandel (especially as

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red), Colombar, and even Chardonnay is up. The demand for Cabernet Sauvignon is dramatically improved and even Merlot is less of a concern, while interest is dramatically increasing for all Muscat and Riesling types.

The number of local small wineries grows and with more labels along with more medals, everyone benefits from recognition for all the hard work and risk. The county as a whole and the local American viticultural appellations within (Lodi, River Junction, and most recently Tracy Hills) continue to confirm the region to be a good place to grow quality fruit for quality wines, which are a value for consumers. In spite of the ongoing challenges to comply with new regulations, while controlling costs within the lagging general economy, 2011 will be more positive than negative for local growers. The long term still looks good and with a brief rest, preparations for 2012 can begin with some cautious optimism.

Fall Checklist

- If the weather stays dry, post-harvest irrigation to help maintain soil moisture is okay until rains are steady.
- Little to no nitrogen should be applied now but potassium now (or early next year) is okay. It won't "move" like nitrogen. To get full benefit of compost it needs to be disked in.
- Make a note of any problem weed species that may be increasing.
- Mark any vines with excessive red leaves and/or leaf roll for monitoring of fruit quality next year or for possible removal before then.
- Renew your Irrigated Lands Regulatory Program (formerly Ag Waiver Discharge) permit/ membership.
- Update your air pollution mitigation plan if you have 100 acres or more in a single vineyard.
- Also, review your pesticide use reports and get everything up to date as there is continued interest to keep agriculture "accountable" for problems real and perceived.
- Check for locations near riparian areas, trees, and other bird roosting sites for VMB. Focus on these areas next spring in any VMB control program. Lorsban (chlorpyrifos) is still an option for a late winter application, but be careful of sprays before any late winter/early spring storms, especially near natural drains and waterways.
- Gophers, voles, and squirrel activity are still common and may deserve attention with baits, gas cartridges, fumigant pellets (usually better in spring), trapping, shooting, or a combination of several of the methods. Remember ground squirrels are fair game, tree squirrels require a depredation permit. Owl boxes can help stabilize rodent populations but do not control them.

Paul Verdegaal, Farm Advisor



Calendar of Events

North San Joaquin Valley Cling Peach Day

December 13, 2011
Stanislaus County Agricultural Center
Service & Crows Landing Roads, Modesto
info: Roger Duncan (209) 525-6800
or raduncan@ucdavis.edu

California Weed Science Society Annual Conference

January 23-25, 2012
Fess Parker's Double Tree Resort, Santa Barbara
info: <http://www.cwss.org/conference.htm>

California League of Food Processors Expo & Showcase

January 31 & February 1, 2012
Sacramento Convention Center
Registration and information:
<http://www.clfp.com/expo-registration>

North San Joaquin Valley Almond Day

Wednesday, February 1, 2012
Stanislaus County Agricultural Center
Service & Crows Landing Roads, Modesto
info: Roger Duncan (209) 525-6800
or raduncan@ucdavis.edu

Northern San Joaquin Valley Processing Tomato Production Meeting

Thursday, February 2, 2012; 8 am to 11 am
Modesto Double Tree Hotel, 1150 Ninth Street, Modesto
contact: Scott Stoddard (209) 385-7403

UC Soil Fertility Short Course

Wednesday, February 22, 2012; 8 am-4:30 pm
Buehler Alumni Center, UC Davis
info: <http://vric.ucdavis.edu>

This short course will focus on the practical aspects of soil fertility management in an era of escalating fertilizer costs and increasing government regulation of nutrient inputs for environmental water quality protection. The topics covered will include: getting the maximum value from soil testing, interpretation of laboratory soil test results, comparing fertilizer sources, developing crop nutrient management plans, fertilizer management and environmental protection.

This program is intended for growers, CCAs, PCAs, government agency personnel and others involved in fertility management planning. The course is sponsored by the UC Vegetable Research and Information Center (VRIC); although the focus will be on nutrient management in annual cropping systems, much of the material presented will be relevant to perennial crops as well. The registration fee is \$125, which includes lunch, refreshments and study materials. CCA and PCA continuing education credits will be requested. Additional information and registration will soon be available on the VRIC website (<http://vric.ucdavis.edu>).

California Small Farm Conference

March 4-6, 2012
Hyatt Regency Valencia, Santa Clarita Convention Center
info: <http://www.californiafarmconference.com/>

FOUR-DAY FARM SUPERVISOR SEMINAR (IN SPANISH)

Stanislaus Agricultural Center, Modesto, California, March 13-16, 2012

Topics that will be covered include employee discipline (including how to deal with the most difficult subordinate behaviors), interpersonal negotiation skills, and the importance of praise in day-to-day communications.

Those who attend will participate in numerous role-plays, and receive individualized attention and evaluation. A copy of the individualized participants' scorecard will be sent to each farm enterprise. Registration limited to two individuals per farm operation.

Any questions, contact Gregorio Billikopf at gebillikopf@ucdavis.edu or 209-525-6800, or Marie Harter at the same phone.

Seminar contents:

- Effective praise
- Interpersonal negotiation skills
- Employee discipline – 7 steps
- Employee discipline – dealing with difficult behavior
- Understanding piece-rate pay design
- Preventing sexual harassment – power and abuse of authority
- Conflict management
- Listening skills
- Participants will have the opportunity to role-play many of the skills discussed.



Seminar cost:

Cost is \$128 and includes materials and lunches over the four days. **Early registration discount:** Those who register early, by January 31, 2012, can do so for \$97. If sending a check, the envelope must be postmarked by January 31, 2012. Registration limited to two individuals per farm operation.

Payment.

You may pay by check or credit card. **If paying by check:** Make checks out to **UC Regents** and mail to Workplace Mediation / c/o G. Billikopf / 3800 Cornucopia Way Suite A, Modesto, CA 95358.

If paying by credit card, go to <http://ucce.ucdavis.edu/survey/survey.cfm?surveynumber=1763>.

Map to the location:

We will meet in Rooms H & I of the **Stanislaus Building**. <http://www.cnr.berkeley.edu/ucce50/ag-labor/7map.htm>

