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THE SCOOP

on fruits and nuts in Stanislaus County

Roger Duncan Retiring July 1, 2024

Roger Duncan, Pomology Farm Advisor, UCCE Stanislaus County

When I started as a UC Cooperative Extension pomology farm advisor in Stanislaus County, I knew I had a lot to learn. But there were a few things that I was certain of – plant your trees far enough apart so the canopies won't touch and shade each other out, prune almond trees every year to keep them productive, and if you are only going to apply one spray each year, it better be a dormant spray of copper, oil, and an organophosphate insecticide. It turns out I was wrong about all that.

Through many years of field research with outstanding cooperation from Stanislaus County growers, PCAs, and other industry members, we have continued to learn how to make our orchards more productive and our inputs more efficient. Pest management, irrigation, and fertilization is so much more precise and efficient now compared to 30 years ago. Now we know that unpruned almond orchards are as productive as orchards that are pruned every year (maybe more), even after 20+ years. We have seen that trees planted more closely down the row don't decline faster than widely spaced trees – and they stay smaller, require less training, are easier to shake, have fewer mummies, and may lead to longer lived, more productive orchards. And even though most almond orchards don't get dormant sprayed anymore, it seems San Jose scale and peach twig borer are rarely the significant problems we feared.

Through my time as the UC Cooperative Extension farm advisor for almonds, peaches, and grapes in Stanislaus County, I have had on-farm research projects with over 100 Stanislaus County growers. I have listed them, to the best of my recollection, below. Some projects were small and lasted one season. Other projects were very involved and lasted for over 20 years. I want to thank these growers, and all the PCAs, consultants, nursery professionals, and allied industry people who participated in these projects and helped strengthen our industries in Stanislaus County. I also want to thank the Almond Board of California and the Cling Peach Board for providing much of the funding for so many trials. I hope you will look through the list of growers and thank someone you know for their contribution in helping keep California agriculture the envy of the world.

I want to thank former UC Farm Advisors Wes Asai and Kathy Kelley Anderson for hiring me as their summer intern in 1988 on a grant from the Norman Ross Horticultural Foundation and later by Jim Stapleton. They helped light the spark that I still

In this issue…

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The Scoop on Fruits and Nuts in Stanislaus County is a combined effort of UC Cooperative Extension Farm Advisors Roger Duncan, Jhalendra Rijal, and Abdelmoneim Z. Mohamed and covers topics on all tree crops, irrigation and soils, and associated pest management.

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have today. I admired their commitment to helping the growers of Stanislaus County, and I was convinced that is what I wanted to do. After returning to school to earn my Master's degree and working at the UC Kearney Agricultural Center with great scientists like Themis Michailides, Ted DeJong, and Mike McKenry, I started as a farm advisor in Sacramento County. I came back to Stanislaus County as a farm advisor in 1995 and was grateful to have the opportunity to serve in the community where I grew up.

Although I will be officially retired on July 1, I have asked to serve as an emeritus advisor, which means I will be allowed to keep my UC email account active and participate in research trials, among other things. I can still be reached at raduncan@ucanr.edu, although I may take a little longer to reply... I am happy to say that this position has been approved to be refilled, which means you will have a new pomology advisor to help you. I hope you all welcome the new person as openly as you did me.

Thank you all, and I wish you success and bountiful harvests in the seasons to come.

Jeff Abraham
Andy Alderson
Ken Aldrin
Haig Arakelian
Glenn Arnold
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Daryl Garber
Lynn Garber
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Erich Gemperle
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Norman Kline
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Robert & Brandon
Longstreth
Jeff McCormack
Vikram Mahal & Chris
Bettencourt
Pete Mahalis
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John & Cliff Starn
Brent Stout
Alan Tillian
Derk Van
Konynenburg
Paul Van
Konynenburg
Lionell Valenzuela
Steve Vella
Scott Viss
Daryl Voortman
Chuck Voss
Jim Waggoner
Rod Walker

Below is a brief description of some recent field trials in Stanislaus County and links to the final reports. All are available at our website: **cestanislaus.ucdavis.edu or scan the QR code at the end of this article.**

22-Year Tree Spacing and Minimal Pruning Trial.

This was a large, twenty-two-year field trial which chronicled the performance of almond trees planted at 22, 18, 14, or 10 feet apart down the row (row spacing 22 feet) and pruned with various pruning strategies, including no pruning. The trial encompassed 37 acres within a large, commercial almond growing operation. The pruning treatment portion of this trial was terminated at the end of 2018 (19th leaf) but harvest data collection continued for the in-row tree spacing portion through the 22nd leaf.

Throughout the duration of this trial, the data have consistently shown that annual, moderate pruning done to open the tree middles and preserve the lower canopy did not improve yield in the short-term or long-term compared to trees that were essentially unpruned for 19 years. Based on the nut value and labor costs during the period of this trial, annual pruning and subsequent lower yields would have reduced grower returns by between $7,500 and $14,000 per acre, depending on variety and rootstock.

In-row tree spacing affected yield, but not as much as anticipated. Nonpareil trees on Nemaguard rootstock planted 10 or 14 feet apart down the row had almost identical cumulative yields over the 22-year period of the trial. Trees planted 18 or 22 feet apart down the row accumulated about 2,300 pounds and 4,900 pounds less per acre, respectively, than trees planted 10 or 14 feet apart. Closer spacing (10 feet) improved yield more for the smaller Carmel variety. The biggest advantage to closer tree spacing was a smaller tree size and increased tree longevity. In this trial, closely planted trees are smaller, shake more easily, have less cumulative shaker injury on their trunks, have fewer mummies per acre, and have lost far fewer trees compared to the most widely spaced trees, regardless of rootstock or pruning strategy. It appears that orchards with trees planted closely down the row may be easier to maintain, be more productive and profitable, and may have a longer productive lifespan than more widely, (conventionally) spaced orchards.

For more information, see the final report **HERE**.* Thank you to growers John Duarte and Robert Longstreth for participating in this trial, and thanks to the Almond Board of California for funding such a long-term project.

Almond Variety Trials.

Regional almond variety trials were established in Madera, Stanislaus, and Butte Counties in 2014. Thirty varieties were compared side by side and repeated four times at each site. Most tested varieties are experimental (only numbers, no names yet) from UC Davis, USDA, and California nurseries. Along with yield, we document bloom time, hull split, harvest time, kernel quality, and rejects due to insects and disease. At the Stanislaus site, the top five yielding varieties (so far) are Y117-91-03 from USDA, UCD 18-20 from UC Davis, Nonpareil, Aldrich, and Yorizane, also from USDA. You can see the most recent full report **HERE**.*

New regional variety trials were planted in Kern, Stanislaus, and Butte Counties and are currently in their second leaf. These trials contain more experimental varieties from UC Davis and USDA, and many new varieties from California nurseries, Australia, and Spain. The most recent report for these trials is **HERE**.* Stay tuned for more information (and field days) as these trials come into production.

Almond Rootstock Trials.

HERE* is the final report of a compilation of long-term field assessments of over 25 rootstocks grown in four counties in California under various irrigation, weather, disease, and soil chemistry conditions. This project encompasses trials conducted by UC Farm Advisors in Stanislaus, Butte, Yolo, and Kern Counties. All trial locations were embedded within commercial orchards and were farmed according to local practices. In each trial, the following data were collected: yield and kernel quality, canopy size, trunk circumference, anchorage, leaf nutrient and salt concentrations, hull boron, hullsplit timing and duration, pathogenic nematodes, and stem water potential.

There are some clear trends in rootstock performance across locations. First, rootstocks should be chosen to best defend against the challenges of your site. In general, most peach almond hybrid rootstocks and Empyrean 1 were the most vigorous across all trials. Lovell, Krymsk 86, and Rootpac R tended to be the smallest trees. The most vigorous rootstocks consistently had the highest yields and largest kernels in all locations. Comparisons of yield per PAR indicated many of the higher vigor peach x almond hybrid rootstocks may also be more yield efficient (more kernel pounds per unit of canopy).

Krymsk 86, Hansen, and Viking have shown excellent anchorage in these trials. Peach x almond hybrid rootstocks have shown very good salt tolerance, along with Empyrean 1. Krymsk 86 and peach rootstocks Lovell, Guardian, Nemaguard, and HBOK 50 can accumulate high, even toxic, levels of sodium and chloride in their leaf tissue. Viking and Cadaman were moderately tolerant to salt accumulation. Rootpac R appears to be tolerant of chloride but can accumulate high levels of sodium.

Peach x almond hybrid rootstocks supported very high numbers of ring nematodes. Tree water status as measured by stem water potential was inconsistent among trials.

Does Compost Improve the Performance of Almond Orchards?

In the first study, we examined whether the addition of composted green waste was beneficial at tree planting time. The trial location was east of Modesto in a San Joaquin sandy loam soil after removal of a vineyard followed by fumigation. Prior to planting, compost was placed in bands down the future tree rows at rates of 0, 5, 10, 20, or 30 tons per acre. Berms were then pulled, incorporating the compost into the berm. Potted trees on Brights 5 rootstock were planted on the berm in May. Trees were monitored for two years. The bottom line: compost did not affect the performance of newly planted trees. Compost did not improve water stress, significantly change leaf nutrients, or increase tree growth, even with very high rates of compost.

In a second, longer-term study, we applied composted green waste or composted manure in two almond orchards at planting time (5.2 tons) and again annually for the next four years (target 10 tons per acre each year). The orchards were monitored for six years. The general trend (not always statistically significant) was that compost slightly increased leaf potassium, nitrogen, and chloride and significantly reduced leaf calcium. It was surprising how small the increase in nitrogen was, considering that 10 tons of compost included an additional 250-300 pounds of nitrogen per acre each year. Although we documented improvements in many USDA soil health measures in the top soil profile, there was no difference in any measure of tree performance, including tree growth, water stress, or yield. You can view the report **HERE**.*

Do self-fertile almond varieties benefit from bees?

Yes. It is still necessary to move pollen from the anthers to the stigma for fertilization to occur. You can see a summary from 2012 **HERE**.* A similar study in 2023 by UC Davis apiculturist, Dr. Elina Nino, confirmed our findings.

Using dormant almond orchards for groundwater recharge.

We found no detrimental effects of flooding an almond orchard with six inches of water each week for four weeks (total of two acre feet) in the month of January. See article on winter recharge **HERE**.*

*For links mentioned in this article, scan this QR code!

First Detection of Red Leaf Blotch: A New Disease of Almond in California

Florent Trouillas, Alejandro Hernandez-Rosas, Rosa Frias, Tawanda Maguyu, Cameron Zuber, and Phoebe Gordon

Background

Red leaf blotch (RLB), caused by the fungal pathogen *Polystigma amygdalinum*, is one of the most important leaf diseases currently affecting almond trees in the Mediterranean basin, particularly in Spain, and regions of the Middle East. In late May 2024, unusual symptoms on leaves, including yellow spots and orange to dark red-brown blotches, were detected in an almond orchard (Nonpareil, Monterey, and Fritz) on the border of Merced and Madera counties. The disease has since been observed in Madera, Merced, San Joaquin, and Stanislaus Counties, indicating the disease is somewhat widespread in the Northern San Joaquin Valley. Following field sampling as well as morphological and DNA/PCR analyses, our laboratory confirmed the detection of *P. amygdalinum* from symptomatic leaves. This is the first detection of *P. amygdalinum* from California almond, although a formal pest confirmation by the California Department of Food and Agriculture (CDFA) is pending. Growers and PCAs should be on the lookout for RLB as it is new to California and a serious disease of almond.

Disease symptoms and biology

Symptoms of RLB initiate as small, pale, yellowish spots or blotches that affect both sides of the leaves (Fig. 1). As the disease progresses, the blotches grow larger (1 to 2 cm) and turn yellow-orange with a reddish-brown center (Fig. 2). At advanced stages of disease development, leaves become necrotic, curl, and drop prematurely. Mainly the leaves are affected, and premature defoliation of trees can occur, thus decreasing the photosynthetic capacity of the tree during the current and following growing season, leading to a general decrease in yield.

The disease is monocyclic, with only one primary infection cycle. The primary inoculum are ascospores that form in perithecia (sexual fruiting bodies) on fallen infected leaves from the previous growing season. Infection occurs after petal fall when young leaves emerge and spring rains occur. Rain is essential for the release and dispersal of ascospores from perithecia. The disease may not be noticed before late April to mid-May as infection remains latent for approximately 35 to 40 days. Infected leaves develop small yellow blotches that expand and become orangish to reddish-brown, with variable shapes and sizes, as the fungus colonizes more leaf tissue. During spring/summer, leaves contain the pycnidia (asexual fruiting bodies) of the fungus, which produce filiform conidia. These asexual spores do not cause new infection on leaves. Infection of leaves decrease drastically after June and with high summer temperatures. Rain combined with mild temperatures in spring and early summer generally lead to higher disease incidence.

Disease Management

Research and experience in Spain where RLB is more common have shown that one preventive fungicide application at petal fall and two additional applications at two and five weeks after petal fall if rains persist are effective at controlling the disease (this exact timing is not critical but depends on the occurrence of rainfall). This means that fungicide applications and timing to control other common diseases of almond in California such as anthracnose, scab and rust will likely also control this pathogen. Researchers in Spain also have shown that FRAC groups 7, 11, M3, M4 and some FRAC3 chemistries are most effective. Cultural practices, focused on eliminating the primary inoculum of infected fallen leaves, also can help mitigate the disease. These consist of removing leaf litter or applying urea to accelerate its decomposition. However, such strategies are only effective when applied over a wide area. Fungicides applied during bloom and after symptoms are visible are not effective.

If you suspect that you have this new disease in your almond orchard, please contact your local UC Cooperative Extension farm advisor.

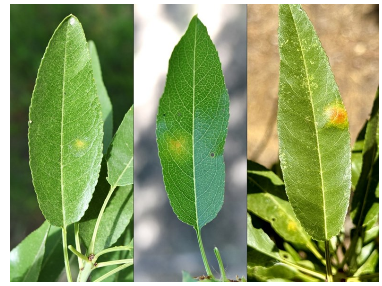


Figure 1. Early symptoms of red leaf blotch include small, pale yellowish spots of blotches that affect both sides of the leaves. (Picture credit: Alejandro Hernandez and Florent Trouillas)

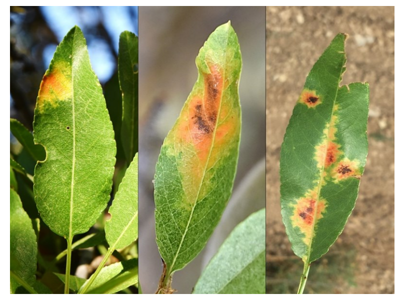


Figure 2. Advanced symptoms of red leaf blotch include larger, yellow-orange blotches (1 to 2 cm) that turn reddish-brown in their center.
(Picture credit: Alejandro Hernandez and Florent Trouillas)

Irrigation Management for Non-Bearing Walnuts

Abdelmoneim Mohamed, UCCE Irrigation and Soils Advisor, Stanislaus

Walnut is currently grown on over 400 thousand acres in California with the majority of production in the Northern San Joaquin Valley (NSJV). The recurring droughts and climate change in California will likely increase the uncertainty in water supply to walnuts and other specialty crops. Good irrigation management for young trees ensures healthier tree development, better resource utilization, and more resilient orchards in the face of climate change. Young walnut trees use less water than mature trees. Young walnuts have lower ET rates and grow rapidly within the season and from year to year. Among the irrigation scheduling methods, tree water status and soil moisture are more useful than ET reports in the first two months of planting. After that, ET needs to be adjusted based on canopy size (discussed later). Stem water potential baselines are appropriate for both young and mature trees. You can use a pressure chamber to maintain the level of stem water potential between -4 to -8 bars from May to August then allow a bit more stress (-10 to -11 bars) to reduce late season shoot growth. This helps the green shoot tissue to mature into woody tissue, which can better handle cold temperatures during fall and winter (Allan Fulton).

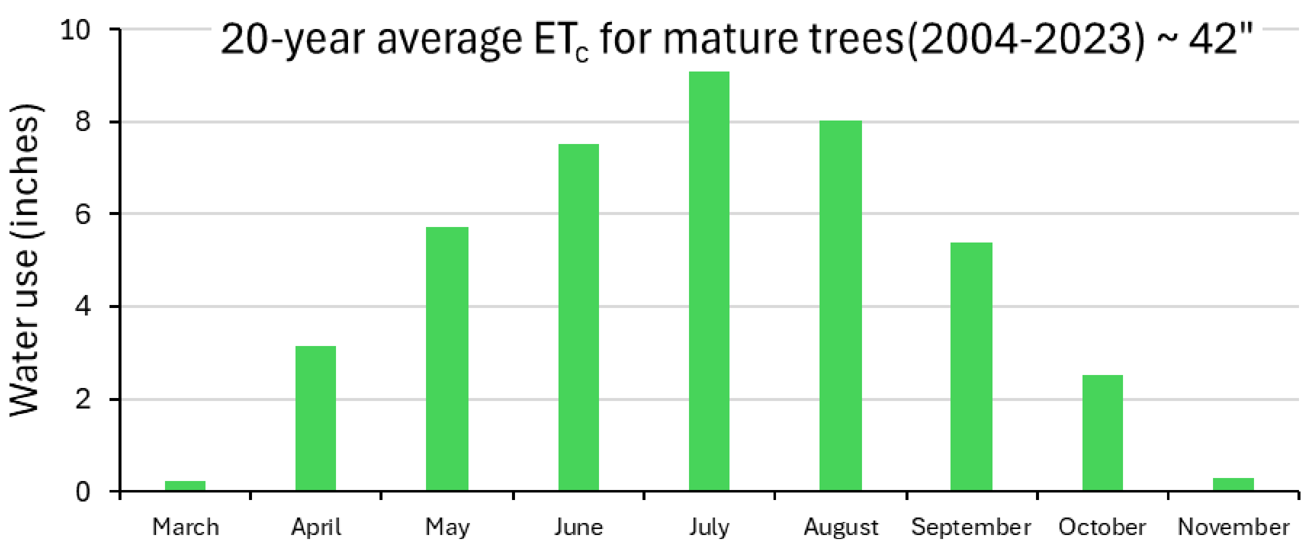
It is suggested to start irrigating 1st leaf trees using drip irrigation using two drippers, each one gallon per hour (gph), for each tree. This provides enough capacity to irrigate the newly planted trees adequately and precisely. This is cost effective when it comes to tight water allocation and weed competition. It’s preferable to use button drip emitters that allow you to plug buttons when trees turn to 3rd leaf. You may consider adding two to four 1-gph emitters in the mid-summer of the 1st leaf or just prior to the 2nd leaf. In the 3rd leaf, convert your irrigation system to a microsprinkler. Another way is to customize a mini-sprinkler system by placing sprinklers close to the tree, within a few feet, and using caps to control the water spray area for the first two years. As the trees grow and their root systems develop, you can remove the caps and relocate the sprinklers further away.

When it comes to using ET reports for young walnuts, you can either use the historical developed ETc, or % ETc based on tree age or % midday canopy shading.

1) **Historical ETc**

ETc values were developed from research conducted in Tehama County to be used as a guideline. Site specific conditions need to be considered (weather, cultivars and rootstocks, irrigation system design, Orchard floor vegetation). You can note how rapidly water use changes within the season and from year to year.

	1st		2nd		3rd	
	in/month	in/day	in/month	in/day	in/month	in/day
April	0.4	0.01	0.9	0.03	1.6	0.05
May	1.5	0.05	2.4	0.08	4.9	0.16
June	2.3	0.08	3.5	0.12	6.6	0.22
July	3.9	0.13	5.6	0.18	9.7	0.31
August	3.4	0.11	4.6	0.15	7.6	0.25
September	2.1	0.07	2.9	0.10	5.2	0.17
October	1	0.03	1.4	0.05	2.9	0.09
Total	14.6		21.3		38.5	



2) Adjusting ET based on tree age as a function of mature tree ET

Consider the age of trees when deciding how much water they need because water use rapidly increases in the first few years of planting. The next table is bi-weekly estimates of % ET based on tree age as a function of mature trees. For example, if you have a weekly ETc of a mature walnut orchard of 1.7 inches during the first week of June then the 2nd leaf tree would require 1.7 x 0.5 = 0.85"

Tree Age	Percent of ETc or Kc for mature trees
1st leaf	30
2nd leaf	50
3rd leaf	85
4th leaf	100

Date	1st leaf	2nd leaf	3rd leaf	4th leaf
Apr 1-15	15	35	70	100
Apr 16-30	20	40	75	100
May 1-15	25	45	85	100
May 16-31	30	45	90	100
June 1-15	30	50	95	100
June 16-30	35	50	95	100
July 1-15	40	55	100	100
July 16-31	40	60	100	100
Aug 1-15	45	60	100	100
Aug 16-31	45	60	100	100
Sept 1-15	40	55	100	100
Sept 16-30	40	55	100	100
Oct 1-15	35	50	100	100
Oct 16-31	30	45	100	100

3) Adjusting ET based on fraction (%) of midday canopy shaded area

After transplanting, the average PAR (measuring midday canopy photosynthetically active radiation interception) in orchards is 1%. The table suggests ETc changes 2% (41/20) per one percent reduction in canopy shaded area for trees smaller than 20 % midday shaded area. An estimated average canopy of 1% suggests a Kc adjustment of 2%. This means reducing the weekly crop ET report to 2%.

Example: If the weekly ETc is 2.2" after considering system efficiency, then the adjusted ET = 2.2 x 0.02 = 0.044".

Several weeks after planting, the average PAR is 5%. The table suggests ETc changes 2.05% (41/20) per one percent reduction in canopy shaded area for trees smaller than 20% midday shaded area. An estimated average canopy of 5% suggests a Kc adjustment of 10%. This means reducing the weekly crop ET report to 10%.

Example: If the weekly ETc is 1.7" after considering system efficiency, then the adjusted ET = 1.7 x 0.1 = 0.17". Gallons per week = [(0.17 x 27,154)/Trees per acre (90)] = 51 gal/week = 7 gal/day. If you have drip irrigation system with 3gph, then irrigate two sets of 9 hours every 3 to 4 days.

Fraction of midday canopy shaded area	% of ET_c for mature orchards
20	41
30	54
40	67
50	79
60	92
70	100

This article is part of young orchard and nutrient management handbook, developed for WETA program and funded by CDFA