Topics in Subtropics Newsletter

University of California Cooperative Extension

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News from the Subtropical Tree Crop Farm Advisors in California

Volume 2, No. 2

April - June 2004

Craig Kallsen is the editor for this issue of the newsletter.

This newsletter is available online at http://cekern.ucdavis.edu or any of the CE office websites listed on page 7

Please let us know if there are specific topics that you would like us to address in subtropical crop production. If you would like to change information on your mailing label please call or send an email message to the farm advisor in the county where you live. In some counties this newsletter is sent electronically. Phone numbers and email addresses can be found at the end of this newsletter. Thank you for your outstanding response to the first four issues of the newsletter. We appreciate your interest and your support.

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UPCOMING MEETINGS

Citrus Research - Growers' Seminars 2004
CRB & UC Cooperative Extension

Porterville: Tuesday, July 6
9:00 a.m. – 1:30 p.m.

Porterville Memorial Building, 1900 W. Olive Avenue

X *A look inside the Australian citrus industry, including research emphasis*
X *Topworking: pros and cons, what you need to know (session to include industry panel and discussion)*
X *Glassy-winged Sharpshooter impact on citrus what we know thus far*
X *More on variety evaluations*
X *Using new budget calculator software*

Dinuba: Wednesday, July 7
9:00 a.m. – 1:30 p.m.

Dinuba Memorial Building, 249 S. Alta Avenue

X *A look inside the Australian citrus industry, including research emphasis*
X *Topworking: pros and cons, what you need to know (session to include industry panel and discussion)*
X *Glassy-winged Sharpshooter impact on citrus - what we know thus far*
X *More on variety evaluations*
X *Using new budget calculator software*

Santa Paula: Thursday, July 8
9:00 a.m. – 1:30 p.m.

Santa Paula Community Center, 530 W. Main Street

X *A look inside the Australian citrus industry, including research emphasis*
X *Topworking: pros and cons, what you need to know (session to include industry panel and discussion)*
X *Glassy-winged Sharpshooter impact on citrus - what we know thus far*
X *Understanding the "sex life" of mandarins and info on mandarin pollination distances*
X *Using new budget calculator software*

Citrus Research - Growers' Seminars 2004 (Continued)

Chico: Wednesday, October 27
9:00 a.m. – 1:30 p.m.
Chico Masonic Family Center, 1110 W. East Avenue

X *Identification of insect pests of citrus and the damage they cause (in-depth 90-minute session including viewing of samples through microscopes)*
X *Principles of frost protection*
X *Using new budget calculator software*
X *PLUS, at the conclusion of the research sessions, the farm advisors will lead a discussion on marketing*

Temecula: Tuesday, November 2
9:00 a.m. – 1:30 p.m.
NEW LOCATION
Pala Casino Hotel, 11154 Highway 76, Pala

X *Using compost/mulch: background information, what to consider, case study*
X *Citrus leafminer: what to expect (what to do, what not to do)*
X *Topworking: pros and cons, what you need to know (session to include industry panel and discussion)*
X *Glassy-winged Sharpshooter impact on citrus - what we know thus far*
X *Using new budget calculator software*

Indio: Wednesday, November 3
9:00 a.m. – 1:30 p.m.
Indian Palms, 48630 Monroe Street

X *Using compost/mulch: background information, what to consider, case study*
X *Update on Pierce's disease in desert grapes; GWSS impact on citrus - what we know thus far*
X *Info on lemon varieties for the desert*
X *Using new budget calculator software*

Update on Pruning and Harvesting Olives Mechanically

Louise Ferguson: Extension Specialist
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The two major factors that drive up table olive production costs are the practices currently requiring manual labor, pruning and harvesting. The most recent table olive cost study by Glenn County Farm Advisor William H. Krueger and colleagues (available free at http://www.coststudies.ucdavis.edu) for flood-irrigated olives projected a 5-ton per acre yield with annual cash costs of $2,403.00. Of this fertilization and manual weed control were 2% each, disease and pest control were 3% each, irrigation was 5%, hand pruning every other year was 8%, and hand harvest, at $275.00 per ton, was a stunning 57% of annual cash costs. The last dwarfs all other production costs and may in time render table olive production unprofitable. If manual pruning and harvesting are also used for oil olives these will be similarly high cost items in oil olive production.

The oil industry may have some advantage in that the orchards can be planted as high density hedgerows that, theoretically, are more amenable to combined mechanical topping and manual pruning and mechanical harvesting. A new UCCE cost study by Farm Advisors Paul Vossen and Joseph H. Connell, and Karen Klonsky, Extension Economist and Peter Livingston, Extension Staff Research Associate, of Department of Agricultural and Resource Economics at University of California at Davis (also available free at http://www.coststudies.ucdavis.edu) details the cost of establishing a super high density olive oil orchard and producing olive oil.

My colleagues and I have investigated mechanical pruning with mature table olive cultivars. Our objective was to produce a tree that could be mechanically harvested; a tree with a 3-foot-high skirt, a 12-foot-diameter canopy and a 13-foot height. These were trees that needed to be reshaped, with mechanical pruning, into hedgerows. Thus the pruning was rehabilitation pruning. Generally the research demonstrated severe mechanical pruning, and particularly mechanical topping, into two-year and-older growth, sharply decreased crop the year of pruning. The general conclusion was that reshaping the trees would require at least two years of yield loss and strong vegetative regrowth that would require

more mechanical pruning. It has not been demonstrated that mature trees, those over 10 years old, can be successfully reshaped for mechanical harvesting without unacceptable yield losses. Nor has it been demonstrated that maintenance mechanical hedging can produce economic annual production. The current recommendation is biennial, light hedging, every other row, every other year, into one-year-old wood and annual light topping, to the height desired after regrowth. The hedging should be on an angle that grows out to produce a flat wall to the row middle.

We have not had the opportunity to investigate the effect of mechanical pruning on young hedgerow table olives. A three-year-old trial at the Nickels Estate in Colusa County should be ready for some mechanical pruning and harvesting in three more years.

The developing olive oil industry may have an advantage in that many of the new olive oil plantings are hedgerows. Butte County Farm Advisor Joe Connell and Glenn County Farm Advisor, William Krueger, are currently cooperating in an irrigation experiment in a hedgerow planting of young oil olives. Their preliminary observation is that a mechanically harvestable shape can be maintained with mechanical topping and the manual pruning that also included removing the larger wood that would broken by the mechanical harvester. If mechanical topping is incorporated into olive oil production it can be started in young olives as a routine production practice, rather than a rehabilitation practice. It remains to be seen if the mechanically topped and manually pruned hedgerow olives can be maintained at the desired height, and in the desired shape, for mechanical harvesting and still produce economic oil yields.

We have also had experience with mechanical harvesting of table olives. As with mechanical pruning we are again dealing with larger, older trees not specifically shaped for mechanical harvesting. At harvest, table olives are physiologically immature, thus the fruit does not detach easily from the stem. A current harvester design is a passively rotating head with padded, 3 ft. rods radiating 360˚. These rods have a 12-inch whip at the end of the rod. This motion, against the sides of the hanging olive branches, is 90% effective in removing the fruit. This removal technology is effective, if the olives are accessible. However, thus far, pruning the tree rows into an acceptable flat fruiting wall has produced unacceptable decreases in yield. Also, the harvesters thus far have inefficient catch frames, dropping 19% of the fruit harvested, and produce unacceptable bruising of the fruit according to one of the two major processors. Currently mechanical harvesting research is not being done on table olives.

Oil olives may have factors making them more amenable to mechanical harvesting. The olives are physiologically mature and will detach easily with the above harvester or shake harvesters. Being larger, softer and less bouncy than immature table olives, they may not drop out of the catch frame as easily. And, if pressed promptly, fruit damage will not be an issue. Theoretically, oil olives are ideal for mechanical harvest. In fact, the limiting factor may be the pressing mill capacity. This may be an issue if a contract harvester is used, as opposed to the grower owning harvesting equipment he can use at the desired intervals.

Among the mechanical harvesters currently being used for oil olive harvest are over the row harvester originally designed for grapes. There is no published data thus far, for California, demonstrating that mature olive oil trees can be maintained at a size suitable for over the row harvesters, and produce acceptable yields, without unacceptable limb breakage. There is also no data demonstrating the effect of these harvesters on oil quality. However, the latter is not expected to be major.

In summary, the California table olive industry will need to develop at least partial mechanical pruning and harvesting practices if they are to compete in the global table olive market. The California olive oil industry will have to develop mechanical harvesting and perhaps, partial mechanical pruning. Fortuitously, it appears the olive oil industry will have a better chance of developing successful mechanical harvesting than the table olive industry. However, currently, no mechanical pruning or harvesting research for oil or table olives is being done in California.

One, One Hundred, One Thousand

Ben Faber, Subtropical Horticulture, Ventura/Santa Barbara

This little mnemonic, or memory aid, in the title is helpful in remembering the critical levels of toxic constituents in irrigation water. The “one” stands for 1 part per million (ppm) of boron (B), the “one hundred” flags 100 ppm of sodium (Na) and chloride (Cl) and the “one thousand” represents the level of total soluble solids (TDS or salts) in water. Levels exceeding the critical values for any of these constituents can present problems for tree growers. The problems typically show themselves as tip-burn and defoliation. The B, Na and Cl are toxic elements

at relatively low concentrations, but symptoms appear similar to the damage caused by high salinity.

Water that exceeds the critical levels mentioned in the mnemonic has a greater tendency to cause damage if sufficient leaching is not applied. It doesn't mean the water is impossible to use, only that greater attention needs to be made to ensure that these salts are adequately leached. High levels of these salts accumulate in the soil with each irrigation. These salts are absorbed by the tree and end up in the leaves where they do damage.

Irrigation is a necessary evil. Every time we apply irrigation water we apply salts, and unless some technique is used to minimize salt accumulation, damage will result. This damage can be more than just leaf drop, but also the stress that induces conditions for root rot. In most years we rely on winter rainfall to correct the salt imbalance resulting from irrigation water.

The last two years have had winters largely without rain. Irrigation water was applied throughout the winter, spring, summer and fall and many trees looked stressed this spring. Even well irrigated orchards in the spring of 2004 had leaf burn due to the gradual accumulation of salts from irrigation. Avocados, which are generally more sensitive to salts than citrus, dropped their salt-burned leaves this spring when flowering began.

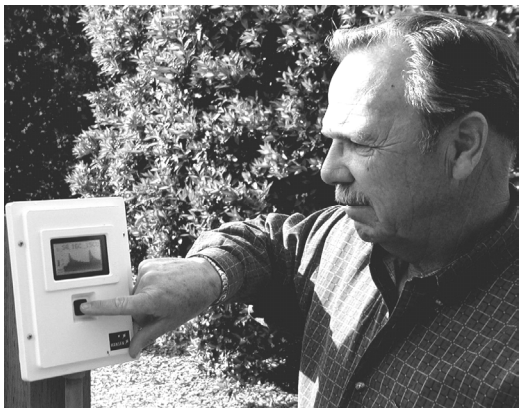
We usually think that it is not necessary to irrigate in the winter, but these last two winters should change that opinion. To add to the lack of rain problem, it may be necessary to irrigate even if there is rain in the future. The wetted pattern that is created by a drip or microsprinkler emitter also creates a ring of salt in the outer band of the wetted patter. If there is less than an inch of rainfall to push this salt down, this salt tends to diffuse towards the tree where it can accumulate back in the root system. Orchards with even good water quality would find it advisable to run the irrigation system with the first rains. Those with poor water quality definitely should run the microsprinkler system with an equivalent of one-half inch-applied water (13,500 gallons per acre) during or soon after the first events of less than one-half inch rainfall. Growers with water quality exceeding one, hundred, or thousand should be especially alert to the need to manage water in low rainfall winters.

Making Sense of Soil Moisture Checking and Sensors

Blake Sanden, Irrigation and Agronomy
Kern County

The best key to unlock efficient irrigation practice is to know exactly how much water your crop uses and replace it in a timely fashion that matches your irrigation system capacity and avoids crop stress and water logging. We have good "normal year" estimates of citrus water use (evapotranspiration, ET) for the San Joaquin Valley, but as any grower knows very few blocks are "normal". The Frost Nucellar on the Cajon loamy sand and fanjets in Edison doesn't behave the same as Fukumoto navel planted to double-line drip on an Exeter clay loam.

So what's the trick for hitting optimum water management for a particular block? You have to keep account of your soil moisture reservoir in the crop root zone. Tracking soil moisture tells you whether you're putting on too much or too little water to meet



crop needs. It's also the key to increasing fruit set and quality in many crops such as canning tomatoes, improving flavor in most wine grape varieties and possibly help control puff and crease in citrus.

But any farmer and most ag consultants will tell you that checking soil moisture is not for the faint of heart because it requires auguring holes, pushing a steel probe tube, and/or installing soil moisture monitoring instruments to depths of 2 to 6 feet depending on the crop. Checking instruments or hand probing needs to be done on at least a weekly basis to be useful.

After pushing, twisting, pounding and digging thousands of holes in hundreds of fields around the San Joaquin Valley I can testify to the fact that this is only slightly more fun than shoveling manure, and

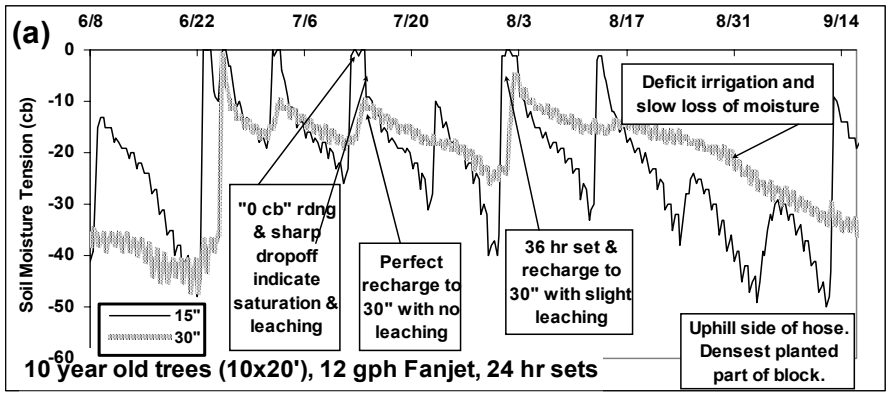
it's a whole lot harder on your shoulders and wrists. The result is that it's not done very often, if at all, and farmers tend to stick to a traditional irrigation schedule. Given all the other decisions and details growers have to see to on a daily basis it's not surprising this activity gets pushed to the side. At the same time, the years of experience a farmer has with a crop and with a particular field often give him an intuitive sense of how to run the water and end up being 75 to 90% efficient anyway! So if you're already this efficient then why auger holes and check moisture anyway?

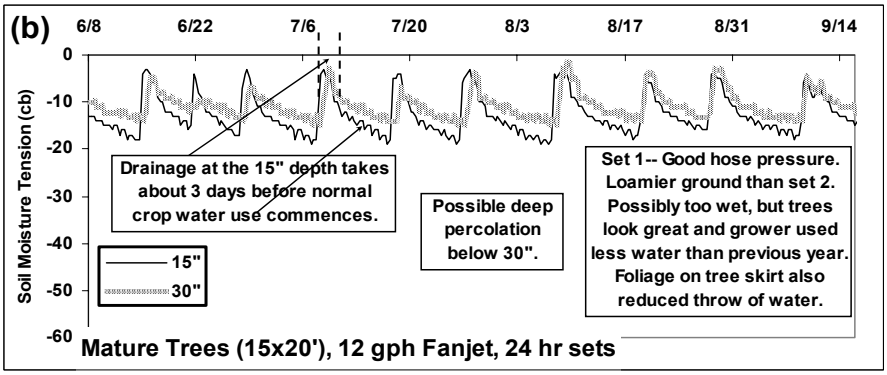
There are two reasons: 1) You're not really sure that you're at the optimum point of the crop water use curve until you check, and 2) The simple math of cost versus benefit. Water monitoring consulting services run around $15/acre/season depending on total acreage and what degree of technology and reporting you want done. If this is the only cost you incur to get the extra 5% out of a 3-bale cotton crop then you've made an extra $22/acre even if cotton is only 50 cents/lb. Even at just $2 net/box, the total from an extra 15 boxes of grapes or extra fancy oranges is a 100% return on your $15 investment.

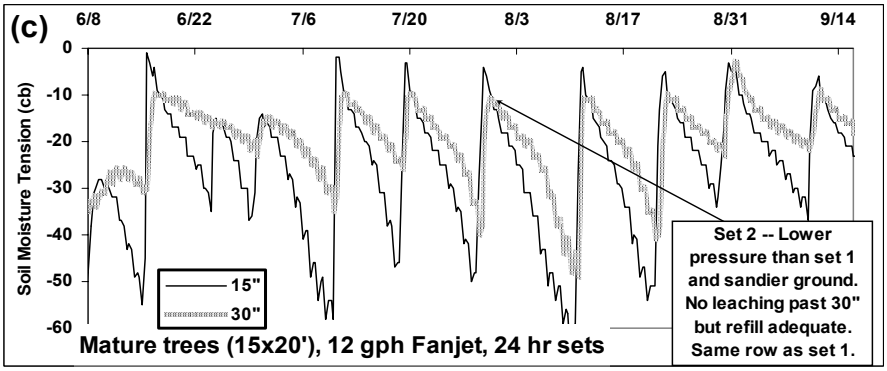
Many growers have tried tensiometers in the past and usually get fed up with the maintenance. A new generation of medium and high technology sensors is now available to growers and consultants. The huge diversity of sensors can be intimidating at first glance but these systems can make this job easier, more accurate and even more affordable. The biggest advantage to the new technology is the use of a continuously recording data logger coupled to responsive soil moisture sensors.

A series of irrigation management/monitoring demonstrations by UC Cooperative Extension over the last 3 years in Kern County has looked at using a combination of 6 granular matrix electrical resistance blocks (Watermark®) coupled to a logger with a graphic display (Hansen AM400®, pictured above) to allow growers a "push button" look at 5 weeks of soil moisture history at any time during the season. The cost of this system is about $600 and should be good for 3 to 5 years. This gives growers a look at the dynamic changes in soil moisture due to actual crop water use and subsequent recharge of the profile during irrigation. The pattern of the peaks and rate of change of these readings is more useful than the actual numbers themselves. Many different sensors and loggers provide this type of information but the AM400/Watermark system is the only combination providing a graphic display in the field without having to download to a computer. Computer downloads can also be done anytime during the season to develop charts such as those shown below.

Charts (a), (b) and (c) show the changes in soil moisture for 2 different blocks of early navels in the Edison area of Kern County for summer 2003. Comments are placed in boxes connected to explain what these patterns mean.







Even though all three of these monitoring locations are within 800 feet of each other we see very different changes in soil moisture. The hedgerow block (a) has many skips as the grower has begun pulling trees and he wants to avoid over watering the whole block.

Charts (b) and (c) are for trees in the same row but different sets. Slightly higher hose pressures and loamier ground keep (b) moister than (c), which shows almost a perfectly efficient pattern of crop water use and recharge. To keep the trees in (c) from looking "hot" required an irrigation frequency for this block that resulted in the wetter condition at location (b). But the bottom line for the grower is these trees have never looked better, he used less water in 2003 and had a better packout than in 2002.

Checkout my website, **http://kernsoilwater.ucdavis.edu,** for some calibration curves and other field examples, both good and bad, under "Using Watermarks in Different Soils". Irrometer, Onset and Spectrum companies also make inexpensive loggers (<$400) that can be used with Watermark blocks. The Watermark block is currently the least expensive, fairly reliable sensor. An excellent website for explaining soil moisture sensors is: **http://www.sowacs.com/sensors/index.html** (Note: use of any product names is not intended as a commercial endorsement.)

Think Twice Before Planting Clementine and W. Murcott Afourer Mandarins

Craig Kallsen, Subtropical Fruit & Pistachio Kern County

Citrus growers commonly talk about putting a few trees of this or that variety in the ground. Of late, I have been hearing from growers who have been talking about planting a few clementine or W. Murcott Afourer citrus trees simply because some of the bigger production companies have been planting thousands of these trees in the southern San Joaquin Valley. However, things just aren't as simple as just putting a few of these kinds of trees in the ground and then expecting to sell the fruit.

Technically, apparently, we can't even call something simple like a 'tangerine' a tangerine anymore. I'm told that just about every orange-colored citrus fruit under the subtropical sun has been sold under the name 'tangerine' and the consumer just doesn't know what to expect when they buy a tangerine. What we used to call tangerines, apparently because a lot of these kinds of citrus fruit were grown around and shipped out of the port of Tangiers in North Africa, are now called mandarins. Now marketers are encouraged to sell a tangerine as a mandarin, and specifically as a particular kind of mandarin. Is it a satsuma mandarin, a clementine, a Fairchild, a Honey, or a hybrid like the Minneola tangelo? The name is important to the consumer because the taste and the seediness of the fruit can depend on what kind of mandarin it is. Seedy mandarins, unless sold in the farmers market, are almost worthless in most citrus marketplaces. Representatives from most mandarin packinghouses will come to the growers' fields and cut fruit to estimate the number of seeds present. It does not take many seeds to make the crop unpackable.

Satsuma, the Gold Nugget, the Shasta, Tahoe and Yosemite mandarins naturally, have very few seeds or are seedless, even when grown adjacent to citrus producing potent pollen and swarming with bees. When the consumer decides to buy one of these mandarins, they know it will be nearly seedless, like a navel.

Other mandarins, like the W. Murcott Afourer, and the clementines, can be seedless if grown away from bees carrying pollen from other citrus varieties that have viable pollen. Minneola tangelos, grapefruits, lemons, Valencia oranges and some other mandarins can all be sources of pollen that bees can carry to W. Murcott and clementines to make them seedy. Work by University of California Citrus Extension Specialist, Dr. Thomas Chao, and others, has shown that it is going to be very difficult for growers to just put in a few clementine or W. Murcott Afourer mandarin trees and expect the fruit to be seedless. His work has shown that trees of these mandarins isolated by as many as 100 rows of non-pollen producing citrus, like the navel, can still become seedy, suggesting that bees are carrying pollen from other varieties of citrus at least this far. Since most citrus growers do not have control of adjacent property and since beekeepers abhor a bee vacuum (i.e. areas with nectar and pollen not currently supporting bees) it will be very difficult for most citrus growers in the San Joaquin Valley of California to produce marketable clementine or W. Murcott mandarins.

Clementine mandarins can pollinate W. Murcott Afourer and visa versa so they should not be

planted close together. The Spanish, famous for growing clementine mandarins, have been working on bee repellents for years, with little success.

Bees can travel over a mile in search of the pollen and nectar that they prefer. Exclusion of bees from the Central Valley is not an option. Beekeepers do need to make a living and many of the beekeepers in the Central Valley come from out of the state of California to provide hives for the almond nut crop. While the pollination period of citrus and almonds do not overlap, the bees need to be kept alive when the almond pollination period is over. Many other crops require pollination by honeybees as well.

Even without bees, the clementine mandarin has been shown to be difficult to grow and, perhaps, is not as well suited to the hot summers of the San Joaquin Valley as it is to the climate in the Mediterranean area. Fruits can granulate readily and they do not store well on the tree. Without the pollination of bees, most clementine mandarin varieties will require treatment with plant growth regulators to stimulate fruit set.

So what is the bottom line? First, the outlook in the short term at least is that the relationship between clementine and W. Murcott Afourer mandarin growers and beekeepers is likely to become less friendly and with litigation a possibility. Secondly, any grower thinking about planting these two varieties of mandarins should think twice, and avoid planting something that is going to be very difficult to grow commercially.

We have mandarin varieties that are seedless, bees or no bees, and these are a planting option now. Also, research work underway at U.C. Riverside, funded through the citrus commodity group (i.e. the Citrus Research Board) is producing seedless versions of some of the old seedy favorites. Some of these varieties should be available within the decade.

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