



Topics in Subtropics Newsletter

University of California Cooperative Extension

Fresno, Kern, Madera, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Tulare, & Ventura Counties

News from the Subtropical Tree Crop Farm Advisors in California

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(Yes, it's late!)

Editor's Note:

Please let us know if your mailing address has changed, or you would like to add someone else to the mailing list. Call or e-mail the farm advisor in the county where you live. Phone numbers and e-mail addresses can be found in the right column.

Please also let us know if there are specific topics that you would like addressed in subtropical crop production. Copies of Topics in Subtropics may also be downloaded from the county Cooperative Extension websites.

Mary Bianchi
Editor of this issue

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MEETING REMINDER

California Avocado Growers Series— 'Creating our Future'
Seminar #2— Avocado Disease Update and Packer Panel
Discussion of Marketing Strategies and Conditions

February 10 (Tuesday): San Luis Obispo (1-4 PM)
February 11 (Wednesday): Ventura (9 AM -12 PM)
February 12 (Thursday): Temecula (1-4 PM)



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DOTHIORELLA LEAF AND STEM BLIGHT

Pathogens: *Botryosphaeria* and *Fusicoccum* spp.

Ben Faber
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Stem and leaf blights are symptoms that appear for various reasons – high rainfall or humidity, spray burn, or chewing insect infestation. Here in California we can add other causes, such as drought and salinity burn. These conditions can cause wounding of leaf and stems, allowing entry of fungal spores that can cause leaf and stem dieback. This condition is most common near the coast where weather conditions can change from mild and low temperatures to extremely high temperature with winds, such as the Santa Anas or the Sundowners in Santa Barbara. Leaves suddenly dry out, causing cracking either at that time or when they are rehydrated with irrigation. Symptoms appear 7 – 10 days after the stress. Cracking allows pathogen spore entry into the wounds and the pathogen grows in the dead tissue. Decay fungi create these spores and they are the same ones that cause decay of dead tissue on the ground. So their spores are everywhere.

The greater part of a tree is dead – the woody part of the branches and trunk. And it is dead tissue that these fungi are feeding on. Most trees will limit the growth of the fungus by sealing off the infection with gums of various sorts. In that case, the disease is limited and you may only see a leaf or small branch dying back. In mature trees it is possible to see a small branch here and there that has died back, but the bulk of the canopy is still green. It has been called “salt and pepper syndrome”, because of that speckled appearance. In the case of young trees with their smaller root systems and a lesser ability to seal off the disease process, a whole tree can die.

Since this is a severe water stress or salt stress induced problem, the most important management technique is to watch the weather forecasts predicting unusual hot, dry weather and make sure the trees are adequately irrigated going into the stressful period. Shallow rooted trees like avocados are more prone to dry out rapidly in these high water demand situations, but it can also occur in other trees (citrus, apple, peach) and shrubs if the weather conditions

are severe enough.

The only solution is to cut out the diseased parts to prevent its further spread. Once the disease starts spreading, the fungus can produce very high numbers of spores which, in the case of avocado, can cause cankers and rots on the fruit.



UC Statewide IPM Program
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Fig. 1. On mature avocado trees (top), there may be just an occasional leaf or stem killed back. In this case there is also the fruit rot caused by the fungus. In the case of young trees (bottom), the whole tree can be killed back to the rootstock.

IRRIGATION STRESS AND EARLY-NAVEL FRUIT MATURITY

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To maximize profits in the early navel orange market, growers need to have large fruit size and sufficient yellow-orange color and a high enough sugar-acid ratio to meet or exceed the legal minimum harvesting standards. Growers of early-maturing navel oranges in Kern County use different strategies to produce these oranges. Some growers irrigate at full evapotranspiration rates nearly up to harvest with the belief this will maximize fruit size, while others begin deficit irrigating a month or two prior to harvest to maximize development of sugar and color to promote earlier maturity. Little information exists in the literature to assist growers in making decisions related to producing early maturing navels such as Beck, Fukumoto and Thompson Improved. After three years of research, we have elucidated some of the trade offs that relate to irrigation strategies and early navel fruit production.

Three different irrigation treatments, defined as low, mid and high, were developed based on the relative amounts of irrigation water applied to the test plots. Each plot consisted of 10 trees in a central row, bordered by 10 similarly irrigated trees in the two adjacent rows. Each treatment was replicated 5 times. The same irrigation treatment was applied to the same plots for the first two years, while in the third year the low treatment was changed to the high treatment to provide information on how rapidly the trees would recover from stress. The different irrigation treatments were administered by using irrigation emitters with different flow rates and by differentially shutting off water to some treatments as needed to achieve desired stress levels. Between growing seasons, the top three feet of soil profile was refilled with water during the winter and differential irrigation began in early August. Measurable differences in tree shaded stem water potential among treatment usually were noted by early September. In the second year of the experiment (2007), the low and mid-irrigation treatments applied approximately 38 and 71 percent, respectively on average, of the water of the

high treatment. Water potential measurements made mid-day on shaded, interior leaves demonstrated that good separation was achieved among the three treatments. In 2007, for example, shaded stem water potential measurement in early September were about -9, -12, and -18 bars for the high, mid and low irrigation treatments, respectively and at harvest in mid October were -12, 18, -24, respectively. Neutron probe measurements also demonstrated that trees differentially depleted available water stored in the soil as the season progressed (data not shown). In 2007, differences in applied water among the treatments were large. Including the increased quantity of water applied to refill the soil profile in the winter, 3.55, 2.58 and 2.11 acre feet of water on a per acre basis, were applied to the high, mid and low irrigation treatments respectively, from October 30 2006 to harvest, October 15 2007. Rainfall was minimal.

Again, using 2007 as an example, as the level of applied water decreased, soluble solids (i.e. sugars) and titratable acid, were greater at harvest, although the sugar acid ratio was not different (see Table 1). Rows in the experimental orchard were oriented east and west. Fruit on the south side of the tree had higher soluble solids concentration and sugar/acid ratio than fruit on the north side of the tree, regardless of irrigation treatment. Fruit juiciness, either measured as weight of juice to weight of fruit (see Table 1) or volume of juice per weight of fruit (results not shown) were not different among irrigation treatments, suggesting the increase in sugars and acid was the result of osmotic adjustment and not fruit dehydration. We were also interested in seeing if the differential irrigation treatments influenced eating quality of the fruit. To test this idea, we provided fruit from the highest and lowest irrigation treatments of 2007 and 2008 to volunteer panelists at the UC Kearney Ag Center and asked if they could detect any differences between the fruit. In both years the panelists could not detect differences between fruit from the two irrigation treatments, suggesting that the increase in soluble solids in the low irrigation treatment was not sufficient to influence eating quality.

In 2007, yield and grade decreased as the amount of applied water decreased (see Table 2). Fruit in the high and mid irrigation treatments peaked on size 56 per carton and on size 72 per carton in low treatment (data not shown). The decrease in fruit grade at pack-out appeared to be largely due to a more oblong shape. The negative yield, fruit size and grade effects measured in the low and mid treatments in 2007 were probably the cumulative result of deficit irrigation in Years 1 and 2 and not just Year 2 alone. Reduced rates of irrigation did increase the color in the fruit compared to the high irrigation treatment (see Table 3) and this occurred every year.

Table 1. Effect of irrigation treatment on juice, soluble solids, and titratable acid of Beck navel orange fruit in the southern San Joaquin Valley. Fruit harvested October 15, 2007

Sample Date	Juice Percentage, by weight			Soluble solids concentration, %			Titratable acid concentration, %			Sugar/Acid Ratio		
	low ¹	mid	high	low	mid	high	low	mid	high	low	mid	high
10/14	26 a ²	26 a	28 a	11.9 c	10.2 b	9.5 a	1.4 b	1.1 a	1.1 a	8.9 a	9.7 a	9.0 a

¹ Low, mid and high refer to the relative amounts of applied irrigation water constituting the three irrigation treatments. The quantity of applied water on an acre basis was 2.11, 2.58, and 3.55 acre feet, for the low, mid and high treatments from the end of October 2006 until October 15, 2007.

² Values in the same cell followed by different letters are significantly different by Fisher's protected LSD test at $P \leq 0.05$.

Table 2. Effect of irrigation treatment on yield, and grade of Beck navel orange fruit in the southern San Joaquin Valley. Fruit harvested October 15, 2007

Irrigation treatment	Yield lbs/tree	Fruit/tree number	Fruit grade, % in category		
			Fancy	Choice	Juice
low ¹	261 ² a ³	566 a	53.4 a	41.6 c	5.0 b
mid	297 b	584 a	61.9 b	33.9 b	4.2 ab
high	358 c	646 b	67.9 c	28.8 a	3.3 b

¹ Low, mid and high refer to the relative amounts of applied irrigation water constituting the three irrigation treatments. The quantity of applied water on an acre basis was 2.11, 2.58, and 3.55 acre feet, for the low, mid and high treatments from the end of October, 2006 through October 15, 2007.

² Each value is the average of separate samples of 10 oranges from the north and south side of the trees in each of 5 replicated plots for each irrigation treatment, except on 10/15 in which 10 oranges were removed at random from the fruit of each plot as it passed through the pack line after harvest.

³ Values in the same cell followed by different letters are significantly different by Fisher's protected LSD test at $P \leq 0.05$.

Table 3. Percent of Beck navel orange fruit in three color categories in response to irrigation treatment at harvest on October 15, 2007 in the southern San Joaquin Valley

Irrigation Treatment	green	yellow-orange	orange
	----- percent of fruit in each color category-----		
low ¹	58.0 ² a ³	42.0 c	0.0 a
mid	78.8 b	21.2 b	0.0 a
high	92.2 c	7.8 a	0.0 a

¹ Low, mid and high refer to the relative amounts of applied irrigation water constituting the three irrigation treatments.
² Each value is the average percentage of fruit in each color category. Each fruit was evaluated automatically by instrument as it passed through the packline at the UC Lindcove Research and Extension Center at Lindcove. Values were calculated from all the fruit harvested from three trees in each of 5 plots.
³ Values in the same column followed by different letters are significantly different by Fisher's protected LSD test at $P \leq 0.05$.

The deleterious effects on yield, and grade on the trees in the low-irrigation treatments suggested that not much would be gained by continuing this level of stress for a third season in the same plots. In 2008, the low irrigation treatment was replaced by a high irrigation treatment and, at harvest, yield by weight and fruit numbers were not different from the control high-irrigation treatment. This observation demonstrated that the Beck navels rebounded quickly from the low irrigation stress of 2006 and 2007. The mid level irrigation stress of 2006 and 2008 was less severe than that of 2007, and yield and fruit quality was not as adversely affected as in 2007.

This study provides information on some of the trade offs that might be expected among fruit yield, size, grade, sugar and color in relation to reduced irriga-

tion as harvest approaches. Information from this study will be available in greater detail in the near future. How growers respond to this information will depend on their approach to profiting in the early navel market and how much water will be available for irrigation. If reducing water use, while minimizing effects on yield and fruit quality compared to fully irrigated orchards, is the primary goal of the grower, work by Dr. Goldhamer, UC irrigation specialist, demonstrated that regulated deficit irrigation in the mid-May through mid-July time period would be the best strategy.

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