Northern Kern County, Orange Cove and LREC had normal short bloom and regular fruit set. Afourer mandarin does not seem to be affected by low winter chilling.

OBJECTIVE 2: Study the pollination, fertilization and seediness of new mandarins.

The results from the hand pollination study at LREC in 2002-2003 are shown in Table 1. The results showed Clementine mandarins and Afourer mandarin are extremely compatible with each other. Pollen from each type of mandarins could cause large number of seeds in the other one. The results also showed the pollen of triploid Tahoe Gold mandarin was able to cause seeds in Nules Clementine but not in Fina Sodea Clementine. We repeated and expanded the crosses in 2003.

In another study trying to determine how far can compatible pollen sources travel in the field to cause seeds in mandarins, we used amplified fragment length polymorphism (AFLP) molecular markers to determine the pollen parentages of mandarin seedlings of fruit samples from two orchards.

The first orchard is located northeast of Madera. From the west of the orchard toward the east, there is a block of Clementine mandarins, followed by an Owari Satsuma mandarin block, an Afourer mandarin block, a Lane Late navel orange block, and a Minneola tangelo block. The AFLP markers were able to clearly identify Clementine mandarin as pollen parents of 26.6% (25 out of 94) of the Afourer mandarin seedlings at west end of the Afourer block. The pollen grains of Clementine mandarins located to the west were able to travel across a minimum of 30 rows of Owari Satsuma mandarins (30 acres) plus two rows of Afourer mandarins (660 feet in total) to pollinate Afourer mandarins. At the east end of the Afourer block, we found 12.73% (14 out of 110) of the Afourer mandarin seedlings were progenies from Minneola tangelos located to the east. The pollen grains of Minneola tangelos were able to travel across a minimum of 92 rows of Lane Late navel oranges (100 acres) plus two rows of Afourer mandarins (1900 feet in total) to pollinate Afourer mandarins. Also, 12.73% (14 out of 110) of the Afourer mandarin seedlings from the east end of the Afourer block were progenies from Clementine mandarins. The pollen grains of Clementine mandarins located to the west were able to travel a minimum of 30 rows of Owari Satsuma mandarins plus 24 rows of Afourer mandarins (1,100 feet in total) to pollinate the Afourer mandarins.

The AFLP markers also identified the Afourer mandarin as the pollen parent of almost all Nules Clementine mandarin seedlings (98.63%, 72 out of 73) at a second orchard north of Bakersfield. The pollen grains of Afourer mandarin were able to travel across a minimum of 74 acres of empty ground from the east or a minimum of 91 rows of Navel (128 acres)(1,840 feet) from the north to pollinate Nules Clementine mandarins.

OBJECTIVE 3: Develop postharvest treatments and storage conditions for new mandarins.

With cooperation from Dr. Mary Lu Arpaia, a study of postharvest storage treatment of Afourer mandarins was conducted in spring 2003. Four treatments were included in the study: (1) packed, waxed, stored at 41°F for 21 days followed by 4 days at 68°F and then 3 days at 55°F; (2) packed, waxed, stored at 37°F for the same timeframe as (1); (3) packed, waxed, stored at 33°F for the same timeframe as in (1); and (4) packed, waxed, and held for 4 days at 68°F then 3 days at 55°F.

The fruits were evaluated for any rotting and subjected to taste panel evaluation. There was no large difference for most characters from the fruit quality evaluation among the four treatments. Based on average scores, the fruit was generally acceptable to this group of panelists. For the visual ratings, the 41°F storage regimen received the highest average score of 7.7, with 33°F, 68°F and 37°F falling slightly lower in ratings. For the flavor evaluation, the scores fell into very close proximity with the 68°F scoring very slightly higher than the other storage treatments.

Using Regulated Deficit Irrigation to Optimize Size in Late Harvest Navels

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Grower profit with late harvest navel oranges can be limited by granulation. This problem was thought to be associated with fruit size — the larger the fruit, the greater the granulation. We are currently conducting a project in a commercial Lane Late orchard in Tulare County evaluating the effects of regulated deficit irrigation (RDI) on harvest fruit size, granulation, and the other yield components in citrus.

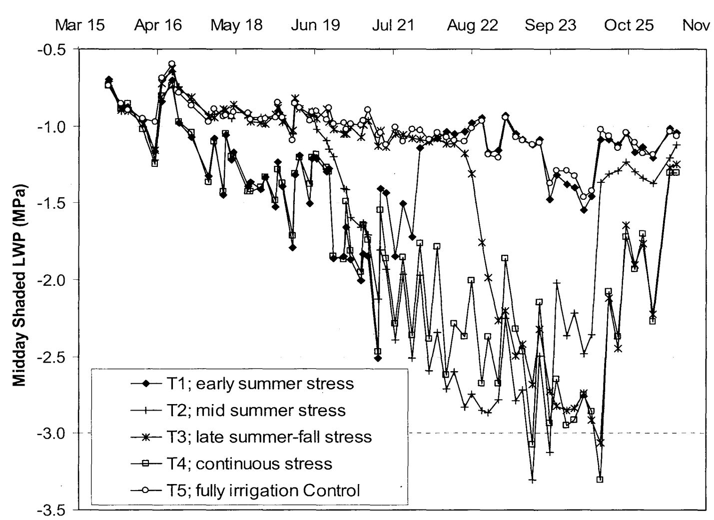


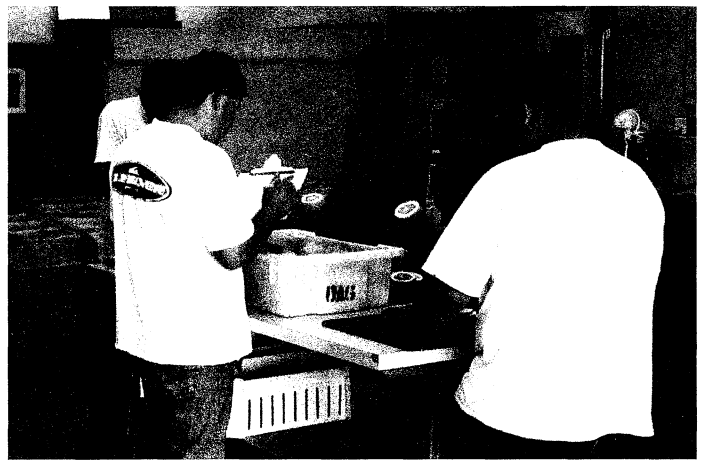
Figure 1. Midday shaded leaf water potential taken during 2002.

Irrigation regimes are imposed based on fruit growth differences between the stressed and fully irrigated trees as well as midday, shaded leaf water potential values. We are testing regimes that impose early (T1), mid-summer (T2), late summer-fall (T3), and continuous stress (T4). These regimes applied 24.5, 23.3, 26.2, and 17.3 inches, respectively, in 2002 (Figure 1). The fully irrigated Control applied 32.2 inches in 2002.

Our original hypothesis was that if harvest fruit size could be reduced by RDI, granulation would also be reduced. In 2003, we found that even though early season stress (T1) resulted in a 15% smaller fruit at the end of the stress period (mid-July), the size subsequently recovered upon reintroduction of full irrigation. At harvest, T1 and the Control had the same size fruit (Table 1). The other RDI regimes reduced fruit size in the 15% range (Table 1). Since fruit loads did not differ significantly between treatments, the reductions in fruit size resulted in significantly lower gross fruit yields for T2-T4; T1 and Control gross yield were similar (Table 1). The production of Fancy fruit was significantly lower than the Control only in T2. Granulation in T1 and T4 was significantly lower than the Control in all fruit size categories (Table 1). Both these regimes imposed stress early in the season. Creasing (% of fruit load having severe enough of this problem to be graded as Choice or Juice) was significantly higher in T2 (26.5%) relative to the Control (7.4%; Table 1). Insect damage was significantly higher than the Control only with T4.

The important findings to date of this project are: 1) granulation was significantly reduced (mean of 6.5% across all size categories vs. 17.1% for the Control) with early season stress (T1) and this wasn't due to having smaller size fruit at harvest, and 2) continuous stress (T4) reduced both granulation and harvest fruit size. Thus, we seem to have RDI regimes that give growers options in terms of both reducing harvest fruit size and/or reducing granulation without negatively affecting other fruit quality parameters. These two RDI options contrast dramatically with allowing mid-summer water stress (T2), which significantly reduced the production of Fancy fruit (Table 1).

It's important to point out that carryover effects of the 2002 stress on the 2003 bloom, fruit set, and fruit load need to be documented before the utility of the RDI regimes being evaluated can be assessed. This is being accomplished with data collection and analysis of the 2003-2004 crop.



Team evaluates granulation and open core.

Table 1. Yield and fruit quality from April 30, 2003 harvest.

IRRIGATION TREATMENT	TOTAL HARVEST WEIGHTS TOTAL TONS/ ACRE	MEAN INDIV-IDUAL FRUIT WT. (GMS)	HARVEST FRUIT LOAD (NO./ TREE)	JUICE (%)	CHOICE (%)	FANCY (%)	SMALL SIZES 88+113+ 138+163 GRANU-LATION (%)	AVERAGE SIZES 56+72 GRANU-LATION (%)	LARGE SIZES 48 GRANU-LATION (%)	EXTRA LARGE SIZES 24+36+40 GRANU-LATION (%)	PERCENT OF FRUIT LOAD AFFECTED BY INDICATED PROBLEM TO RESULT IN FRUIT GRADED AS CHOICE OR JUICE: CREASING (%)	INSECT (%)	COLOR (%)	OTHER (%)
T1; early summer stress	31.9 b*	300 c	400	12.4 a	30.4	57.2 b	1.2 a	4.3 a	6.6 ab	13.9 ab	3.1 a	21.0 ab***	1.4	17.2****
T2; mid summer stress	26.0 a	250 ab	391	25.6 b	37.1	37.3 a	2.6 ab	6.5 ab	9.6 b	15.5 ab	26.5 c	20.4 ab	0.6	15.2
T3; late summer-fall stress	25.3 a	264 b	361	17.2 ab	30.7	52.1 b	4.4 ab	14.0 c	15.4 c	22.2 bc	13.1 b	16.8 a	0.8	17.3
T4; continuous stress	22.3 a	242 a	346	16.1 ab	35.8	48.2 ab	1.1 a	2.2 a	3.2 a	8.8 a	8.0 ab	24.5 b	1.4	17.4
T5; fully irrigation Control	30.4 b	315 c	363	17.1 ab	30.3	52.6 b	5.8 b	10.5 bc	21.4 d	30.7 c	7.4 ab	16.2 a	1.8	22.1
			NSD**		NSD								NSD	NSD

* Values not followed by the same better are statistically different based using Fisher's Protected Least Significant Difference Method at the 5% confidence level.
** Not statistically different.
*** Mostly Kadidid; some Thrip.
**** Mostly soft fruit.