SRA63, and SRA92) from the beginning of June to the end of July on a weekly basis and from August to maturity on a biweekly basis. We also will collect fruit samples to determine the timing of fruit reaching different solid: acid ratios. We also collect leaf samples for nutrient analyses to establish basic nutrition information of new mandarins.

OBJECTIVE (2):

Study the pollination, fertilization and seediness of new mandarins. We made the following crosses at Lindcove on April 8-10, 2002:

FEMALE PARENT	TYPE OF CROSS	MALE PARENT	NUMBER OF FLOWER CROSSED OR TAGGED
Fina Sodea	Selfing	-	100
Fina Sodea	Parthenocarpy	-	100
Fina Sodea	Open pollinated	-	100
Fina Sodea	Out crossed	Afourer	107
Fina Sodea	Out crossed	Gold Nugget	117
Fina Sodea	Out crossed	TDE3	116
Marisol	Selfing	-	100
Marisol	Parthenocarpy	-	100
Marisol	Open pollinated	-	100
Nules	Out crossed	TDE3	103
Nules	Out crossed	Afourer	106
Afourer	Out crossed	Nules	107
Afourer	Out crossed	Fina Sodea	113

We will study the fruit set percentage, fruit drop percentage, fruit size, fruit weight, seed number of selfed, open-pollinated, parthenocarpy, and cross pollinated Clementine mandarins, Afourer , Gold Nugget , and TDE . All crosses will be harvested in winter 2002-2003.

OBJECTIVE (3):

Develop post-harvest treatments and storage condition for new mandarins.

We will initiate the postharvest treatment experiments for Afourer mandarin (Delite) in 2003. Four cartons of fruits of the same size, from one block and one type of rootstock, will be used for the experiment. We will harvest fruit at three times: in early February, early March, and early April of 2003. Following are the experiment treatments: (1) Wash fruit, store at 37^0 for 21 days, followed by 68^0 for 4 days, then followed by 55^0 for 5 days; (2) Wash/wax fruit, store at 37^0 for 21 days, followed by 68^0 for 4 days, then followed by 55^0 for 5 days; (3) Wash fruit, store at 33^0 for 21 days, followed by 68^0 for 4 days, then followed by 55^0 for 5 days; (4) Wash/non-wax fruit, store at 33^0 for 21 days, followed by 68^0 for 4 days, then followed by 55^0 for 5 days. All fruit after storage will be evaluated for color, sugar:acid ratio, external quality. Non-waxed fruit also will be evaluated for weight loss.

Using Regulated Deficit Irrigation to Optimize Size in Late Harvest Navels

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Grower profits with late harvest navels can be significantly reduced due to granulation. In serious cases, 40-60% of the fruit can be affected by this problem that can lead to the perception of poor fruit quality for packinghouses or labels. Granulation is apparently related to both fruit size and harvest date; large fruit and later harvests produce more granulation. The traditional

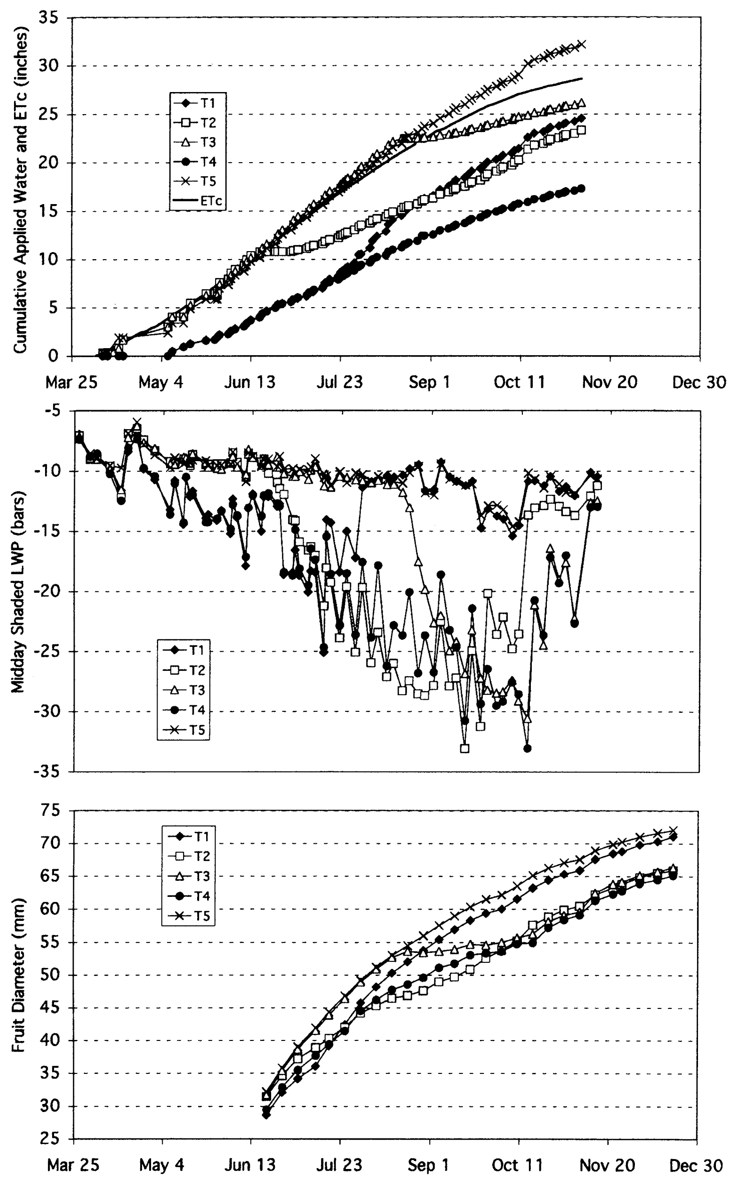

Figure 1: Time course development of a) applied water and evapotranspiration (ETc),b) midday shaded leaf water potential (LWP); the more negative, the greater the tree stress, and c) fruit diameter. Time scales are the same for all three parts of the figure.

approach to this problem has been to harvest relatively early; however, this can limit the options growers have for market timing, reducing grower profits.

We are currently conducting a project to control fruit growth and thus, harvest fruit size, using regulated deficit irrigation (RDI). The supposition is that if we can reduce harvest fruit size, granulation will be reduced. Irrigation regimes are imposed based on fruit growth differences between the stressed and fully irrigated trees. The challenge in using stress to reduce fruit size is to accomplish this goal without negatively affecting other tree performance parameters, including the following season s crop and needed vegetative growth.

This project is located in Tulare County using 14-year-old Lane Late on trifoliate. The existing microsprinkler irrigation system has been modified to enable independent irrigation scheduling in the test block. We are evaluating four RDI regimes in addition to a fully irrigated control. The treatments are as follows:

T1: Early season stress. Induce tree water stress severe enough to reduce fruit size prior to July 1. This requires delaying the onset of spring irrigation. Full irrigation follows the stress period.

T2: Mid season stress. Same as Treatment 1 except that the stress will be imposed in mid-summer (July-September).

T3: Late season stress. Stress period is imposed in the late summer-early fall (September-November).

T4: Season-long stress. Differences in fruit size between this treatment and the fully irrigated trees are used to limit fruit growth throughout the irrigation season. We try to maintain about a 15% smaller fruit throughout the season with this regime.

T5: Fully irrigated control.

Each treatment is replicated 6 times. Each replicate contains 25 trees (5 rows of 5 trees) with the interior 9 trees monitored. Midday shaded leaf water potential (LWP) is measured multiple times per week to access tree water status. Fruit diameter is measured manually with calipers on tagged fruit (4 fruit on each of the 6 monitored trees per plot in each replication 720 fruit total) once per week.

Applied water, LWP, and fruit diameter with time for the first year of this experiment are shown in Figure 1. Applied water from early April through early November was 24.5, 23.3, 26.2, and 17.3 inches for the respective RDI regimes compared with 32.2 inches for the control. This resulted in large differences in tree stress; the RDI regimes exceeded -30 bars on occasion while the control was in the -8 to -15 bar range throughout the summer.

After the stress period through June, T1 fruit diameter was 15% lower than the control but subsequently recovered almost all of that difference after the trees were returned to full irrigation. Thus, we changed our management protocol to also impose some stress after the primary stress period in the other RDI regimes. Fruit diameter as of late December was about 9% lower than the control for T2, T3, and T4. It should be noted that T1 will go through an additional year of early season stress prior to the May 2003 harvest suggesting that this treatment will also have a smaller harvest size than the control.

SUMMARY REPORT

Effect of Timing of Application of Phosphite and Urea for Increasing Lemon Size, Quality and Economics

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Lemon growers in the Coachella Valley are experimenting with applying fertilizers (urea and/or potassium phosphite) by spraying the fertilizers on the leaves of lemon trees during early fruit growth. This technique has been used successfully to increase fruit size when applied at maximum peel thickness on navel oranges in the San Joaquin Valley. Maximum peel thickness corresponds to the stage in fruit development when all the cells that are in the peel have been made. From that point on, cells are enlarging thus giving the fruit its size.

Our goal is to delay maximum peel thickness so that more cells will make up the peel and thus effect a larger fruit size as compared to those fruit where maximum peel thickness was not delayed. It is not known if these treatments will increase lemon fruit size in the desert. Additionally, the occurrence of maximum peel thickness is not known for lemons grown in the Coachella Valley. If the treatments are successful, the results of the research will provide growers with instructions for the optimal time on a calendar basis to apply urea and/or potassium phosphite to lemons to increase fruit size and potentially increase revenues for fruit. In addition, temperature-based guidelines will be developed to advise growers on which days during the year the treatments should be made.

A commercial lemon orchard manager was selected to oversee the site throughout the trial. The site for the experiment is a grove of Eureka lemons on Volkameriana rootstock that was planted in 1993 and is located in Thermal. We are utilizing 35 acres for 10 treatments with 11 replications/treatment. The treatments are listed in Table 1. We used a representative potassium phosphite product, e.g. Formula 1. Treatments were applied with a commercial sprayer; a buffer row was left between treatment rows and buffer trees were left between treatment blocks.

To determine maximum peel thickness, fruit from each of three blooms were sampled on 10-day intervals from April 19 through July 19. Maximum peel thickness is listed in Table 2 by year of evaluation. A three-year average indicates that maximum peel thickness is generally reached by the 10th of May. There was no correlation between degree days to timing of maximum peel thickness.

YEAR	MAX. PEEL THICKNESS	SPRAY TIMING
2000	4-28 to 5-10	5-3, 7-6
2001	5-11 to 5-24	6-18, 7-23
2002	5-6 to 5-21	

Table 2. Year of evaluation, date maximum peel thickness was attained and date for each spray.