

## **Breeding of New Citrus Scion Varieties**

*Project Leader:*

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The objectives of this project are to develop new mandarin, orange, lemon and grapefruit cultivars suitable for California conditions. Developing new varieties is a long-term project that has been funded by the CRB since 1994.

The greatest emphasis is on mandarins for which important traits are seedlessness, easy peeling, good flavor, high rind color, economic yield and low tendency to alternate bearing. Two major methods are used in the project: 1) development of low-seeded hybrids by crossing diploid and tetraploid parents to produce triploids (like Oroblanco and the TDE mandarin hybrid series), and 2) irradiation of budwood of seedy varieties to induce mutations that confer low-seed content. Progress on most specific objectives is on schedule as summarized below.

One major change was a decision to move toward a June 2006 release of Tango, a selection of W. Murcott that has less than 1 seed per fruit even when not isolated. We expect to have adequate data to justify release by that time. Earlier release should allow more California growers to produce low-seeded fruit of this variety. Implementing this early release diverted resources from some other aspects of the project.



*Figure 1. Trial tree of Tango mandarin in December 2006 showing typical crop load.*

Hybridization: New hybridization focused on early mandarin types as planned. The total number of pollinations was about 400. 800-1,000 pollinations had been planned, but we gave higher priority to evaluating whether Clementine and W. Murcott would have increased seed content if pollinated by Tango.

Propagation of existing hybrids: Propagation of about 1,200 seedlings from previous hybridization continued on schedule. 300 trees were planted or budded in the field. We budded 75 hybrids onto field-planted rootstocks and propagated additional trees from the same crosses in the greenhouse using our standard procedure. 25 additional field buddings will be done in Spring 2006. Comparison of these approaches will show whether field-budding has significant advantages.

Molecular-genetic tests: We planned to test representative seedlings of each cross with DNA markers to verify hybridity, and with flow cytometry to determine ploidy level. This was not done during 2005 because considerable effort was devoted to an unsuccessful search for molecular markers to distinguish Tango from standard W. Murcott. We screened about 2,500 standard AFLP marker bands, and also tested for differences in DNA methylation between these varieties. No repeatable differences were found. Additional work on markers for Tango will be conducted during 2005-2006.

Initial evaluation of hybrids: A total of 44 newly fruiting hybrids were evaluated for shape, fruit color, flavor, seediness, yield, tree size, diseases and other traits and of these two grapefruit and three mandarins are promising.

Induction of seedless mutations by irradiation: We irradiated about 300 buds in an effort to obtain low-seeded selections of Fallglo, lemon and certain other mandarins that have not produced low-seeded types. Trees from earlier irradiations were propagated, and about 100 were planted in the field at Lindcove.

Initial evaluation of trees from irradiated buds: All field planted trees were evaluated for vigor, seediness, fruit size, fruit quality, and pollen fertility (which is related to seediness in solid blocks). Nine new selections showed low seed number for at least two years and are being propagated for larger-scale evaluation.

Advanced trials: Selected hybrids and low-seeded selections are evaluated in advanced trials at 7 locations that represent the major production areas of California: UC/Riverside, South Coast, Coachella Valley Agricultural Research Stations (CVARS), Santa Paula, Arvin, Lindcove, and Woodlake. About 720 new trees on Carrizo and C35 rootstocks were planted in the field using 2 replications of 6-tree plots.

Data on fruit quality, particularly seediness, were collected from fruiting trees at UCR, South Coast, and Santa Paula. Trees at the other locations are not yet fruiting. Yield records were collected at Lindcove, UCR, South Coast and Santa Paula. In the future, we hope to topwork additional selections onto navels in isolated blocks to evaluate productivity when isolated from other pollen sources.

Effects of new cultivars on seed content of adjacent varieties: To evaluate their effect on seediness of Clementine and W. Murcott, for the past three years we crossed Gold Nugget, Shasta Gold<sup>®</sup> (TDE2), Tahoe Gold<sup>®</sup> (TDE3), and Yosemite Gold<sup>®</sup> (TDE4) mandarin hybrids onto these varieties. Results from these crosses indicate no significant problems of seed set in the target varieties.

In 2005 we crossed Tango and standard W. Murcott onto Clementines and found that Tango pollen does not set seed in Clementines whereas standard W. Murcott sets high numbers of seed. We also found that pollen of Tango is much smaller than pollen of W. Murcott and germinates very poorly (<5% vs >70%).

Repropagation of selected parents from fields at UCR that are scheduled for development continued. About 75% of the selections that will be kept have been repropagated.