

CALIFORNIA CITRUS NURSERY BOARD**Final Report – January 2010****Project Leader:** Mikeal L. Roose**Location:** Botany and Plant Sciences, University of California, Riverside, CA 92521**Phone:** 951-827-4137 **FAX:** 951-827-4437 **E-Mail:** mikeal.roose@ucr.edu**Project Title:** Breeding of New Citrus Scion Varieties**Project Objectives:**

The objectives of this project are to develop new mandarin, orange, lemon and grapefruit cultivars suitable for California conditions. For mandarin cultivars, important traits are seedlessness, easy peeling, good flavor, high rind color, economic yield and low tendency to alternate bearing. For grapefruit-type cultivars, the primary objective is to develop deeply red pigmented cultivars with no seeds, sweet taste and low bitterness suitable for production in desert or inland valley regions. For lemons, the primary objective is a Lisbon type with very few seeds. The major approaches being used are hybridization-selection for mandarins and grapefruit, and mutation induction to obtain seedless forms of existing mandarins, oranges, and lemons. Promising selections are evaluated in field trials for tree size, yield, fruit quality, and disease susceptibility. Progress on specific objectives is listed below.

2009 Progress and Findings:

1) Hybridization. New hybridization focused on producing triploids with internal color, and on early-maturing triploids and diploids. One parent was a selected tetraploid of pummelo x blood orange ancestry that has excellent color and flavor and low acidity. This was crossed with diploid mandarins having early, mid-, and late season maturity with the intent of producing a mandarin/tangor-like fruit with the 'bright raspberry' color of the tetraploid parent (not the deep purple found in many blood oranges). Diploid females were Clemenules, Fremont, and King, while diploid pollen parents for the reciprocal cross were Lee, Fremont, and Encore. More than 275 pollinations were made using these parents. Fruit have not yet been collected for seed extraction.

2) Conduct pollinations to determine potential for cross-pollination-induced seed set in promising irradiated mandarin selections. Selections pollinated included Encore IR6, Kinnow IR5, and Nova IR10. Pollen sources were Clemenules, Daisy, Encore, Fairchild, and W. Murcott. Seeds from these crosses have potential as commercial cultivars, and may inherit the low-seeded trait of their female parent. More than 1600 pollinations were performed for these and the crosses described in 9) below. Results will not be known until fruit are harvested and seed counted.

3) Induction of seedless mutations by irradiation. A total of more than 1500 buds of Clementine selections, Eureka and Lisbon lemons, 'Cocktail' grapefruit and 'Ponkan' (for

the growing Asian community in the US) were irradiated. We also irradiated four unreleased selections that are promising but excessively seedy in mixed blocks: two mandarin hybrids (VI 609 and VI 668), a tetraploid pummelo x blood orange hybrid, and Fremont IR2 which still has excessive seed content. No trees from new irradiation were planted during the current year. Modification of the greenhouse at Lindcove was delayed to early 2010.

4) Propagation of existing hybrids (from new). Propagation of about 250 seedlings from previous hybridization continued as planned. Only about 16 new hybrids were planted in the field in Riverside due to field space limitations. About 200 are being held in the greenhouse because no suitable space is currently available.

5) Molecular-genetic tests. No marker testing of hybrids was conducted during 2009 due to personnel changes. Considerable effort was devoted to identifying markers to distinguish Tango from W. Murcott (partially funded by our IP partner, Eurosemillas). We continue to evaluate candidate markers originally identified by microarray analysis.

6) Initial evaluation of hybrids. Approximately 600 hybrids were evaluated for fruit shape, fruit color, flavor, seediness, yield, tree size, diseases and other traits. In 2009 some promising new hybrids were identified, but these will be evaluated for additional years before cleanup and propagation for advanced trials.

7) Initial evaluation of trees from irradiated buds. About 313 field-planted trees were evaluated for vigor, seediness, fruit size, fruit quality and, as needed, pollen fertility (which can be related to seediness in solid blocks). No addition selections were made this year because evaluation of older trees has been completed and many newer trees have not yet fruited or are just beginning to fruit.

8) Advanced trials. Selected hybrids and low-seeded selections were evaluated in advanced trials at 7 locations that represent the major production areas of California: UCR, South Coast, CVARS, Santa Paula, Arvin, Lindcove, and Woodlake. Yield records are being collected for the most promising selections at Lindcove, UCR, and South Coast. The only new planting was a very promising low-seeded Lisbon lemon selection. Data on fruit quality, particularly seediness, were collected from over 3500 fruiting trees at all seven locations. Most low-seeded selections have remained very low-seeded in these trials. The Nova IR10 selection continues to be promising, but the two most promising Fremont selections are either small or too seedy and thus the seedy selection has been re-irradiated. Kinnow IR2, previously considered promising, was eliminated due to excessive limb breakage. 27 selections were discarded and have been or are being removed at all locations as resources allow. This will create space to plant new selections. 32 selections remain in these trials: 6 hybrids and irradiated selections of three unreleased mandarin hybrids, Clementina Fina, Clemenules, Oroval, Daisy, Encore, Fairchild, Fremont, Fallglo, Kinnow, Lee, Limoneira 8A Lisbon, Ortanique, and W. Murcott.

9) Effects of new cultivars on seed content of adjacent varieties. Pollen from three low-seeded selections, Encore IR6, Kinnow IR5, and Nova IR10 was crossed onto Clemenules, Daisy, Encore, Fairchild and W. Murcott to evaluate their effects on seediness of these cultivars. Pollen viability of 8 selections and their normal progenitors was evaluated using in vitro germination tests.

10) Tango bud distribution. A final distribution of Tango buds from registered trees at Willits and Newcomb was made in February 2009. In the future, screenhouses at CCPP and registered trees at nurseries will supply budwood.

11) Release of new selections –DaisySL (tested as Daisy IR1) was released August 1, 2009. Budwood of FairchildLS (tested as Fairchild IR2) will be released in January 2010. We have approval to release KinnowLS as of December 2009, but budwood will not be available from CCPP until June or perhaps September 2010, so announcement of this release will not occur until later in January 2010. Nova IR10 and Encore IR6 may be released in summer 2010. Following meetings with the nursery industry, we are developing a program to allow nurseries pre-release access to budwood of new selections so they can grow a limited number of budsources trees. Descriptions of Tango, DaisySL (and other varieties recently released by the program) are available as pdf files at <http://plantbiology.ucr.edu/faculty/roose.html> (this is a new address)

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