

Breeding of New Citrus Scion Varieties

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Citrus scion breeding produces new potential varieties by hybridization or induction of mutations and then evaluates them at several locations in California. This process is slow because it requires at least two cycles of tree propagation and evaluation. The UCR breeding program, funded by the CRB since 1994, now has a “pipeline” filled with many new selections at various stages of evaluation.

We expect new varieties to be released at a relatively rapid pace over the next 10 years. These varieties are available to California growers for several years before release elsewhere and are likely to perform well here where they were developed. The program focuses on new mandarin types because these are increasingly important in the market, and many successful varieties have originated from breeding. The traits emphasized include excellent flavor, seedlessness, easy-peeling, high rind color, economic yield and low tendency to alternate bearing. A minor focus is on grapefruit types, particularly a pink or red low-acid type similar to Oroblanco.

Two major strategies are used: 1) Development of low-seeded hybrids by crossing parents that produce triploids (like Oroblanco and the TDE mandarin hybrid series), and 2) Irradiation of budwood of seedy varieties of all types to induce mutations that confer low-seed content. Progress of specific objectives is summarized below.

Hybridization: New pollination was limited to crosses designed to evaluate potential seediness of new selections and their ability to cause seeds in existing varieties. To test seediness of new selections, a total of 802 flowers of Fairchild IR2, Daisy IR1, Nova IR10, Encore IR6, Kinnow IR2, Kinnow IR5, and Lee x Nova were hand-pollinated by W. Murcott and Clemenules. Seed counts were low in all selections, but Fairchild IR2 was somewhat higher than the others (4.3 to 5.1 seeds per fruit). Fairchild IR2, Daisy IR1, Nova IR10, Kinnow IR1 and Kinnow IR5 mandarins were crossed onto Clemenules and W. Murcott to evaluate their effects on seediness of these cultivars. A total of 542 pollinations showed low (< 3.0) seed counts in all crosses except those with Fairchild IR2 pollen which gave 2.6-3.5 seeds per fruit. The 6 selections tested had low to moderate (7-28%) pollen germination. About 250 hybrid seed were obtained from these hybridization experiments and will be grown out for evaluation as potential new varieties.

Propagation of existing hybrids and parents: About 250 seedlings from previous hybridization continued in propagation and about 210 were planted in the field during 2008. With UCR funding, one greenhouse used for propagation is being upgraded to meet expected ACP exclusion standards.

Initial evaluation of hybrids: Almost 600 new hybrids were evaluated for fruit shape, fruit color, flavor, seediness, yield, tree size, diseases and other traits. In 2008, two new grapefruit hybrids and one new mandarin hybrids were selected and submitted to CCPP for testing. Two grapefruit types and three mandarins identified previously continue to be promising and are being propagated for replicated trials.



Figure 1. Eight-year-old mother tree of DaisySL on Carrizo citrange rootstock.

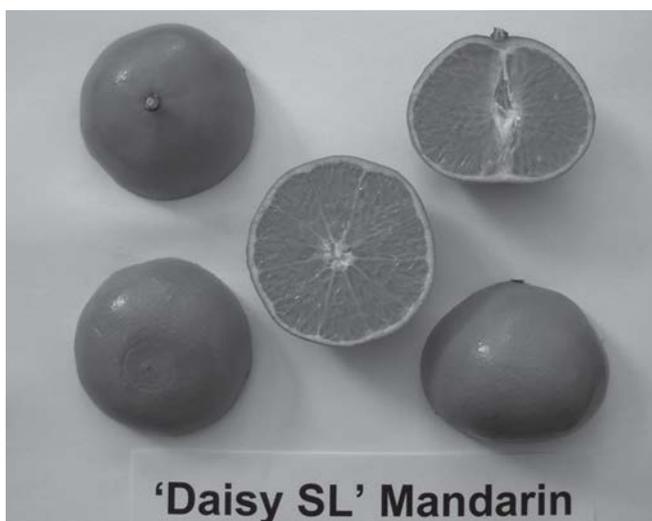


Figure 2. Fruit of DaisySL.

Induction of seedless mutations by irradiation: About 1000 buds of Clemenules, Robinson mandarin, Ponkan mandarin, California Honey mandarin, and Cocktail grapefruit were irradiated and trees propagated for future planting. About 700 trees from earlier irradiation were planted in the field at UCR and Lindcove.

Initial evaluation of trees from irradiated buds: About 183 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). Two new selections of Limoneira 8A and two of Cutter Valencia were made. 582 irradiated first test trees at Lindcove and 284 at Riverside were removed in 2007 (all evaluations and selections were complete) to make way for new irradiation plantings at these site.

Advanced trials: Selected hybrids and low-seeded selections were evaluated in advanced trials at UCR, South Coast, CVARS, Santa Paula, Arvin, Lindcove, and Woodlake. A total of about 252 new trees on Carrizo and C35 rootstock were planted in the field at 6 locations (the Santa Paula site is currently full). Data on fruit quality, particularly seediness, were collected from over 3,500 fruiting trees at all seven locations. Most low-seeded selections have remained very low-seeded in these trials. Selections of Nova and Fremont appear promising. Yield records are being collected for the most promising selections at Lindcove, UCR, and South Coast.

Release of new selections: In January 2009 we requested permission to release a low-seeded selection of Daisy, tentatively named 'DaisySL' (Figures 1 and 2). Release may occur in February if approved. Low-seeded selections of Fairchild and Kinnow mandarin may be released in June 2009. The selection of Kinnow previously considered most promising had major problems with limb breakage in 2007 and 2008, and we have concluded that an alternative selection is likely to be superior. In 2007/8, these selections of Daisy, Fairchild and Kinnow averaged 1.41 to 2.23 seeds per fruit, somewhat more than Tango (0.22) but much less than their seedy "parent" forms (14-22). Descriptions of Tango and other varieties recently released by the program are available as pdf files at <http://plantbiology.ucr.edu/people/Roose?>. (The question mark is part of the address.)

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