

Citrus Clonal Protection Program

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The California Citrus Clonal Protection Program (CCPP) is a part of the University of California, Riverside, Department of Plant Pathology. The CCPP is a cooperative program with the California Department of Food and Agriculture (CDFA), the United States Department of Agriculture Animal and Plant Health Inspection Service (USDA-APHIS) and the citrus growers of the state of California represented by the Citrus Research Board (CRB).

The CCPP is responsible for the introduction, disease diagnosis, pathogen elimination, maintenance and distribution of true to type primary citrus propagative material of all the important fruit and rootstock varieties for the needs of the California citrus industry and citrus researchers. We at the CCPP wish to thank the CRB for its support.

2005-2006 Summary

During 2006, 19 citrus varieties (12 public domain, Table 1, and 7 proprietary) completed therapy (shoot tip grafting and/or thermotherapy) and released from state and federal quarantine after completing the VI Index. The VI Index is the most comprehensive index that a variety undergoes during quarantine in CCPP. The VI Index includes bud inoculation into a host range of 60 citrus seedling and propagation plants that are kept at very specific environmental conditions, which will accentuate symptom expression if a pathogen is present. Additional laboratory tests, sPAGE, Hybridization, and RT-PCR (Citrus Viroids), ELISA (Tristeza) and culture for *S. citri* (Stubborn Disease) are also a part of the VI Index.

Clean and healthy trees of these varieties, after propagation in the CCPP quarantine facilities at Riverside, were planted at the Lindcove Foundation-Evaluation Block as well as into the Protected Foundation Block in the fall of 2006. These trees will be carefully evaluated several times per year by CCPP for trueness-to-type, fruit quality and overall health and growth characteristics. All trees will be annually retested for tristeza for the life of the tree by CCPP.

The CCPP Lindcove Foundation-Evaluation Block of field planted trees numbers 1,187 trees, including Foundation Stock, field evaluation trials, and backup trees, which are planted on roughly 20 acres.

There are 333 individual varieties now in the collection with 31 more added this year. Of this total of 1,187 trees, there are 283 trees that are maintained by CCPP as CDFA Registered budwood source trees. To maintain registration, these 283 trees must undergo an annual index into West Indian Lime (Tristeza, Vein Enation), index into citron every third year, the citron is used to produce tissue for sPAGE, Hybridization and/or RT-PCR (Citrus Viroids), and index to sweet orange every fifth year looking for the presence of Psorosis and related diseases. This reindexing is all done at the CCPP Rubidoux Greenhouse at Riverside.

The CCPP has continued to add new and repropagate old varieties in the screenhouse Protected Foundation collection at Lindcove. The protected screenhouse contained 450 propagations and 25 more were added this year. Most varieties are housed as pairs so while the old original pot-bound trees are replaced with a new propagation a mature tree for each variety will be always available.

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Figure 1. Total budwood sales, 2006

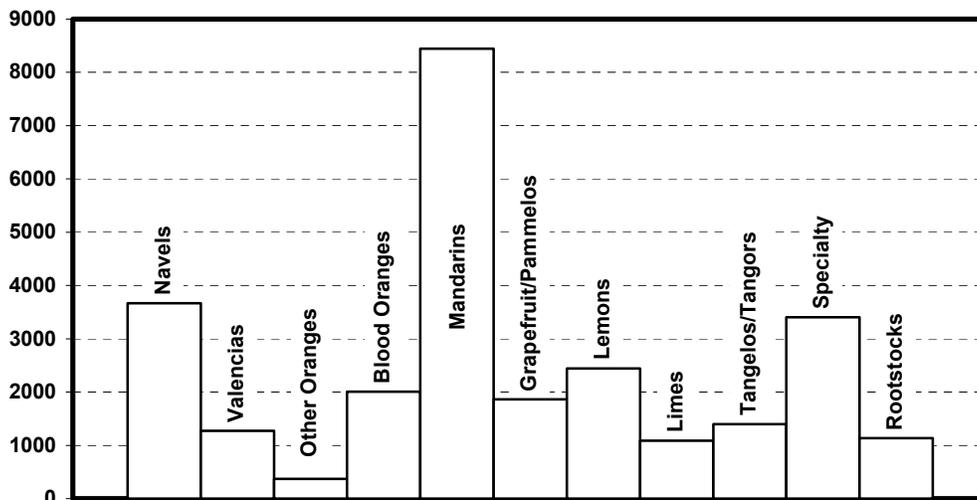
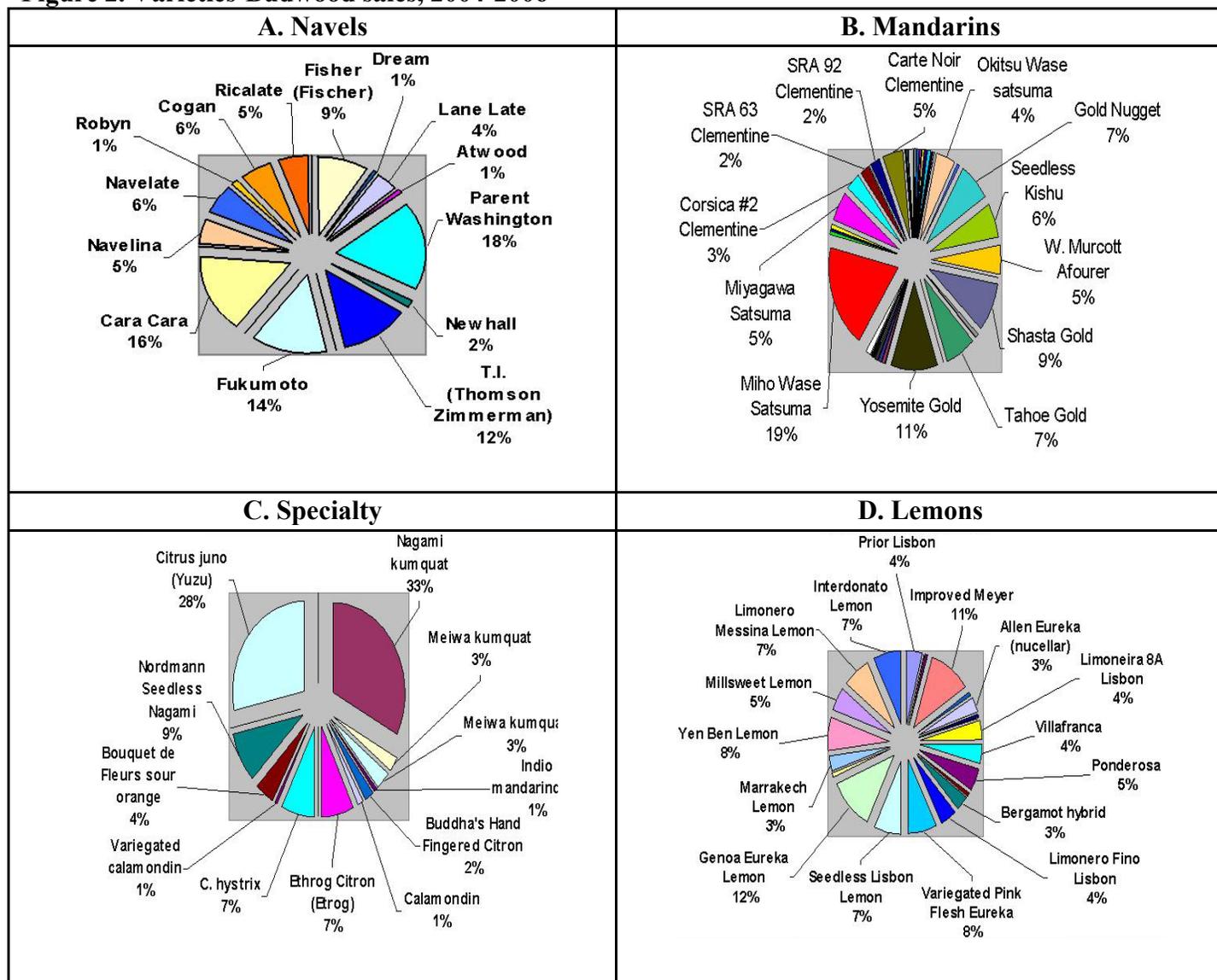


Figure 2. Varieties-Budwood sales, 2004-2006



During the 2006 tristeza testing there were no positive trees identified in the Lindcove Foundation-Evaluation Blocks. The tristeza positive trees identified in the 2005 testing were removed at the time of identification and the registration process for the trees of the Protected Foundation Block, is already in progress in order to avoid any future major interruptions of the budwood flow. In 2006 CCPP distributed approximately 27,000 buds (2004-2005: 31,598 buds) with Navel oranges, Mandarins and Specialty varieties representing approximately the 57% of the total sales (Fig. 1). This pattern was similar with the 2005 budwood sales with the exception of the Specialty varieties that replaced the Lemons as the third most popular citrus group.

From the most popular citrus groups the varieties with the highest budwood sales for the last three years (2004-2006) were, for the Navels the Parent Washington, Cara Cara and Fukumoto (Fig. 2A), for the Mandarins the Miho Wase

Satsuma and Yosemite Gold (Fig 2B), for the Specialty citrus the Nagami kumquat and the Citrus Yuzu (Fig. 2C), and for the Lemons the Genoa Eureka and Improved Meyer (Fig. 2D).

The CCPP continued this year the collection of fruit evaluation data from field propagations during 2-3 week intervals just prior to and during fruit maturity. This year's evaluation information is available at the web page http://www.ccpp.ucr.edu/tests/LREC_37.html along with the 2005 data. The CCPP also continued adding pictures and fruit data to the individual variety websites at www.ccpp.ucr.edu. Additionally, the variety data are now shared with the website of the University of California/Riverside Citrus Variety Collection <http://www.citrusvariety.ucr.edu/citrus/index.html> with dual links from and towards the CCPP website. A unique e-mail address was created for the communication needs of the CCPP at the ccpp@ucr.edu and already have received dozens of citrus related questions from around the world (i.e. Canada,

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Greece, Italy, Peru). This address is dedicated to the CCPP and it is not related to any personal e-mails.

The CCPP again hosted a Foundation Block Field Day in December of 2006, which was very well attended. During this field day the entire Foundation Collection as well as the Cultivar Bank and experimental plots were available for viewing and fruit tasting. Fruit from CCPP trees was also made available for the annual Lindcove fruit display for growers, the World Ag Expo, the Citrus Mutual Citrus Showcase, and other events of this type.

The last semester of 2006 members of the CCPP committee of the CRB as well as the facilities planner for the College of Natural and Agricultural Sciences visited the Rubidoux quarantine facilities in an effort to evaluate their aged status and proceed with the planning for their restoration and improvement.

The Rubidoux quarantine facilities have been for over 50 years the entry, testing and therapy point for all the newly imported citrus varieties into California. Rubidoux is an ideal quarantine location since is isolated from the main citricultural area of the state, all the biodiagnostic protocols for citrus diseases have been tested and standardized on that specific location for decades, is part of the UC Riverside campus and therefore has access to a variety of very important resources mainly the numerous faculty of the different principals of the plant sciences and biology.

The continued availability of disease-tested propagation material from the CCPP is essential for the continued protection of California's citrus industry. The CCPP is dedicated to helping maintain California in the forefront of high quality fruit production.

As part of that effort in 2006 the CCPP resumed the tristeza, psorosis, and viroid testing for the cooperative registration testing of nursery owned citrus scion and seed source trees with the CDFA. This program insures that citrus nurseries will have a supply of clean propagation budwood so that they can produce the highest quality nursery stock for the California commercial groves.

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