

Citrus Clonal Protection Program (CCPP)

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The California Citrus Clonal Protection Program (CCPP) is a part of the University of California, Riverside, Department of Plant Pathology and Microbiology. 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 industry of the state of California represented by the California Citrus Nursery Board (CCNB) and the Citrus Research Board (CRB), which is the primary supporting agency.

The CCPP has six functional pillars: (1) The introduction of citrus varieties in the state of California; (2) The testing of the citrus varieties propagative material for graft transmissible diseases/pathogens; (3) The elimination of the disease causing pathogens from the propagative material; (4) The maintenance and continuous disease testing of the sources of the citrus propagative material; (5) The distribution of true to type primary citrus propagative material for the needs of the California citrus industry and researchers; and (6) The extension of citrus related information.

2007-2008 Summary

1. Introduction of citrus varieties in the state of California: During 2008, the CCPP received eight (8) proprietary and three (3) public domain varieties for introduction and/or release into California. Sources of the newly introduced varieties were established under quarantine at the Rubidoux facilities and disease testing and therapy procedures were initiated.

2 & 3. Disease testing and pathogen elimination: In 2008, fourteen public domain citrus varieties (Table 1) completed therapy (shoot tip grafting and/or thermotherapy) and VI In dex. 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. The varieties currently pending released from state and federal quarantine are presented in Table 1.

In addition, during 2008 the CCPP secured the available funds and laboratory space in order to establish a real time PCR testing facility for the Huanglongbing disease of citrus. This laboratory will supplement and greatly enhance the biological testing protocols of the CCPP and will provide the opportunity for the development and employment of new laboratory tests for the detection of other citrus pathogens.

Table 1. Varieties Pending Release to the Public Domain, 2008

VI	Variety	Origin
VI 762	Fairchild IR #2	CPB, UCR
VI 763	Daisy IR #1	CPB, UCR
VI 764	Kinnow IR #2	CPB, UCR
VI 766	Encore IR #6	CPB, UCR
VI 767	Nova IR #10	CPB, UCR
VI 768	Clemelin Hybrid	IVIA, Spain
VI 769	China 6-21 Satsuma	PR China
VI 770	China 6-22 Satsuma	PR China
VI 771	Jamaican UGLI Tangelo	Grand Cayman
VI 772	USDA 77-19 Tangelo	USDA, Florida
VI 773	Citrus Iyo Tangor	New Zealand
VI 774	Chironja 3-4 Corozal graperuit hybrid	Puerto Rico
VI 775	Fisk Transgenic	UC Davis
VI 776	Hawaiian Pink Shaddock	USDA APHIS

Table 2. Citrus Sources in the CCPP Protected Foundation Block, 2008

LREC-Screen	Varieties	Trees
Total	300	530
Registered	172	280
Pot	250	462
Ground	50	68
Future	108	~1000

4. Maintenance and continuous testing of citrus sources: When released from quarantine, healthy tree sources are planted at the Lindcove Foundation-Evaluation Block as well as into the Protected Foundation Block. These trees are carefully evaluated several times per year by CCPP for trueness-to-type, fruit quality, and overall health and growth characteristics. All CCPP trees at the Lindcove station (LREC) are tested annually for tristeza for the life of the tree by CCPP, while the trees registered for budwood distribution are receiving additional disease tests as required from the CDFA regulations.

In 2008, the CCPP Protected Foundation Block became the primary source of budwood for the state of California since the annual tristeza survey of LREC (spring of 2008) showed that positive trees outside the CCPP collection had increased to 75 while eight more tristeza-positive trees were detected in the Foundation-Evaluation Block by the CCPP personnel.

The three budwood distributions (January, June and September) for 2008 were performed exclusively from the 530 trees (68 in-ground and 462 potted) of the Protected Foundation Block. To further increase the budwood capacity of the Protected Foundation Block, more than 1,000 propagations of approximately 100 varieties were prepared for planting in the existing and the expanded Block, expected to be completed during 2009 with the support of the CRB (Table 2).

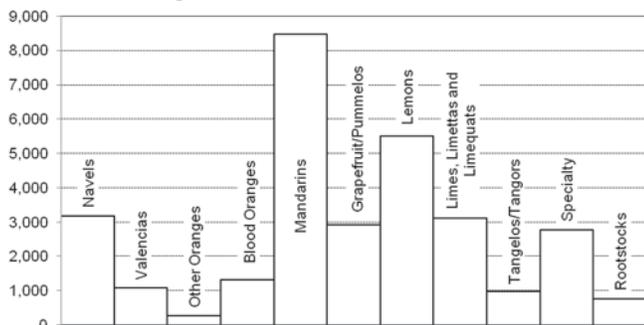


Figure 1. Total budwood distribution, 2008

The registration procedure for the CCPP budwood sources includes an annual index into West Indian Lime (Tristeza, Vein Enation), index into citron every third year (citrus viroids), and index to sweet orange/dweet tangor every fifth year (Psorosis and related diseases) which for 2008 was performed on the registered trees of the Protected Foundation Block while the trees of the Foundation-Evaluation Block received only the annual tristeza ELISA test.

Following its commitment for the control of graft-transmissible disease of citrus in California, the CCPP in collaboration with the Central California Tristeza Eradication Agency and the CCNB resumed the testing for the cooperative registration of nursery-owned citrus scion and seed source trees. 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.

5. Budwood distribution: During the 2008 season the CCPP budwood online ordering system performed well while the ordering history of each user was updated with information prior to the launch of the system in 2007.

In 2008, CCPP distributed approximately 30,500 buds (2007: 24,500, 2006: 27,000, 2004-2005: 31,600 buds) with the Mandarins representing approximately 30% of the budwood demand triple of that of Navel oranges, Grapefruit/Pummelos, Specialty varieties and Limes, Limettas and Limequats. Lemons classified second in demand reaching almost 20% of the distributed budwood (Fig. 1).

Clementines have been the most popular mandarins representing almost 45% of the mandarin budwood distributed in the past two years. The rest of the mandarin varieties represented approximately 5-10% of the total distributed budwood (Fig. 2)

6. Extension of citrus information: 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 along with data from previous years have been loaded in the new CCPP web site interface which will allow the user to see and compare fruit information in a dynamic manner. For example, the user will be able to select specific varieties and compare specific characteristics (i.e. sugar acid ratios) for a specific time period. This project is supported by the CCNB in collaboration with the UCR Citrus Variety Collection and therefore the user will have access in two different set of data. The database platform was completed during 2008 (Fig 3), and we expect the public interface to be launched during 2009.

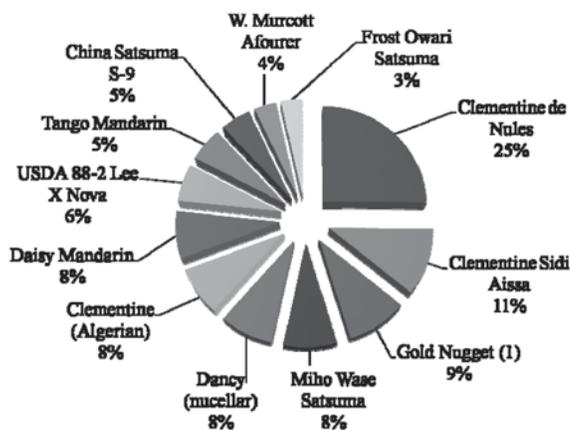


Figure 2. Mandarin budwood distribution, 2007-2008



Figure 3. Web-dynamic database platform of the new CCPP website.

The CCPP again hosted a Foundation Block Field Day in December of 2008, 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 Citrus Research Board exhibits at the World Ag Expo and the California Citrus Mutual Citrus Showcase, and other events of this type.

The CCPP is dedicated to helping maintain California in the forefront of high quality fruit production. The continued availability of disease-tested propagation material from the CCPP is essential for the continued protection and viability of California's citrus industry. We at the CCPP wish to thank the CRB for its continuous support.

NOTICE: The research results included in this publication are summary reports for the benefit of the Citrus Research Board and the growers it serves. They are not to be taken as recommendations from either the individual reporting or the agency doing the research. *Some of the materials and methods mentioned are neither cleared nor registered for commercial use.* The summaries were written by the project leaders identified. Both technical names and registered trademarks of materials are used at the discretion of the authors and do not constitute any endorsement or approval of the materials discussed. Questions on possible applications should be directed to the local University of California Extension Specialist, a licensed PCA, or the appropriate regulatory agency.