USDA-ARS National Clonal Germplasm Repository for Citrus & Dates
Riverside, California

Annual Report
CY2005

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The National Clonal Germplasm Repository for Citrus & Dates (NCGRCD) in Riverside, California, is a unit of the Agricultural Research Service (ARS) of the United States Department of Agriculture (USDA). The mission of the Repository is to acquire, preserve, distribute, and evaluate germplasm of *Citrus,* 32 related Aurantioideae genera, and date palms *(Phoenix dactylifera)* and related species, and to conduct research that enables the mission to be better accomplished. The NCGRCD is located on the campus of the University of California, Riverside (UCR) and the accomplishments are in close cooperation with UCR.

The Repository was established in 1987 on the campus of UCR, which provides a number of services and support to NCGRCD through a Research Support Agreement (RSA), through the Dept of Agricultural Operations, UCR. Specific Cooperative Agreements are in place with Drs. Mikeal L Roose, Tracy L Kahn, Dept of Botany & Plant Science, UCR. More information on these SCAs is presented below. Two direct funded SCAs are administered by the Repository, with Dr Michael Stanghellini, Dept of Plant Pathology (Biology and Control of Soil-borne Pathogens in Greenhouse Production) and Dr Thomas Bellows, Dept of Entomology (Biological Control of the Giant Whitefly). Additional information on cooperation between the NCGRCD and the University is detailed in the appropriate sections. Additional UC facilities utilized include the Coachella Valley Agricultural Research Station (CVARS), located in Thermal, and the South Coast Research and Extension Center (SCREC), located in Irvine.

The Repository is served administratively by the ARS Riverside Location staff housed at the USSL, Riverside, and by the ARS Pacific West Area (PWA) staff, Albany. The Repository is a part of the USDA National Plant Germplasm System (NPGS), under National Program 301: Plant, Microbial, and Insect Genetic Resources, Genomics, and Genetic improvement.

Germplasm Collections

The NCGRCD may be thought of as a 'collection of collections. These collections include the Protected Collection; the Citrus Variety Collection (CVC); the Citrus Relatives Collections; and the Date Palm Collections. All these collections consist of living trees due to the limitations associated with preservation and distribution of these crops as seed.

The overall state of the citrus germplasm collections is summarized in Table 1. Currently, 29 of the 33 genera in the subfamily *Aurantioideae* are represented in the various collections. However, some of these genera are represented by only one species. Another weakness is that due to the confused state of *Aurantioideae* taxonomy, it is unclear exactly how much of the genetic diversity is represented. A complete listing of Repository holdings may be found at the GRIN website: http://www.ars-grin.gov/.

Protected Collection

The Protected Collection consists of small potted trees that are propagated from pathogen-tested budwood. These trees are the source of budwood for distributions. Except under unusual circumstances, budwood is not distributed from other sources. The virus-tested collection is maintained under screen to prevent infection via insect vectors. Stringent precautions are also taken as far as sanitation, etc. There are currently over 375 accessions under

screen, represented by over 850 individual trees. Most of the accessions maintained in the screenhouse are available for distribution. The rest are under non-propagation agreements, have not been released, or are being evaluated prior to official accessioning.

Accessions maintained in the Protected Collection are re-tested annually for CTV by ELISA. Trees to be used for distributions are often re-tested for CTV by ELISA prior to budwood cuts. This is probably somewhat redundant given the protected status of the collection. In addition, we will be implementing re-testing every 4-5 years for exocortis, other viroids, and psorosis. This will put the Protected Collection in accordance with California state regulations for registered nursery trees. In 2005, the trees in the Protected Collection were tested for *Citrus leaf blotch virus* (CLBV) using RT-PCR.

Accessions are added to the Protected Collection after being pathogen tested following quarantine at either the Repository or the UC Citrus Clonal Protection Program (CCPP). If an accession originates from outside the US, it must be quarantined and released from quarantine by USDA-APHIS and CDFA officials before it can be added to the virus-tested collection (or planted outside the quarantine facilities). Accessions originating domestically from outside of California (and from some areas within California) must be released from quarantine by CDFA but not APHIS.

Pathogen testing has been ongoing at NCGRCD and a number of accessions are being held under quarantine. A quarantine report is attached to this report. Several years ago there were some problems with the soil mix used, which compromised the results of the indexing. These particular accessions were consequently re-indexed. There are still a few pending tests (mainly sPAGE for viroids) for these plants, after which quarantine release will be applied for. It is anticipated that the majority of the trees in the indexing program will be added to the Protected Collection by the end of 2006. Not all of these will initially be available since in some cases (those received as seed), they have not flowered nor fruited. These may be available by special request, however.

Citrus Variety Collection

The UCR Citrus Variety Collection (Dr Tracy L Kahn, UCR Dept of Botany & Plant Science, Curator) is used cooperatively by the NCGRCD for characterization/evaluation, as a seed source, and occasionally as a source of miscellaneous other materials for distribution (leaves, flowers, pollen, DNA extracts, etc). Trees in the CVC which are used for seed collection must be indexed for CLBV. The Repository maintains a Specific Cooperative Agreement (SCA) with Dr Kahn to support maintenance and evaluation of the CVC. Cooperation with Dr Kahn is ongoing in the area of evaluation.

There are currently over 900 accessions maintained in the CVC. This includes accessions only planted in the CVC, not those maintained only in greenhouses or at SCREC (see below). In 2005, several new accessions were planted in the CVC, several trees needing replacement were re-planted, and plants are being propagated to replace those which will be removed due to freeway construction. About 150 seedlings, monoembryonic types, are maintained in the field at CVARS.

Because of concern of the UCR budget, Dr. Kahn has started an endowment campaign for the CVC. The long range goal is to generate sufficient annual funds to cover the costs associated with the maintenance and preservation of this important source of citrus genetic information.

Citrus Relatives Collection

There are approximately 80 accessions of species of Aurantioideae genera other than *Citrus* that are maintained in greenhouses, the CVC, SREC, or CVARS. Additional citrus relative trees were planted at SCREC in 2005, and more are being propagated to enable consolidation of blocks and removal of older blocks.

The citrus relatives often are more sensitive than citrus to factors such as cold, heat, pesticides, fertilizers, etc. For these reasons, several plants of each accession are maintained in NCGRCD or in greenhouses (on loan from UCR). Because of these factors, citrus relatives are maintained under the more moderate coastal temperatures of the SCREC. The planting at CVARS was established in order to determine if the higher heat load in this low desert environment would produce more flowering and fruiting than at the more moderate locations, even if the environmental conditions are subtropical rather than tropical. At Riverside, these may have to be maintained in greenhouses.

The SCREC is located adjacent to the El Toro Marine Air Base (ETMAB) which was recently closed. The future of SCREC is uncertain. It is likely the ETMAB will be utilized as a recreational/cultural/residential area, thus increasing the value of the land, and the SCREC may be sold in the future.

Date palm Collection

The date palm collection currently consists of approximately 68 accessions. Their disease-free status is maintained by a California state quarantine for the desert areas. Due to the difficulty of obtaining and quarantining new date palms, it is unlikely that this collection will grow very quickly in the future.

These date palms were originally a collection developed by the USDA Date and Citrus Station in Indio. When that station was closed in 1979, the dates were moved to the USDA irrigated Desert Research Station (IDRS) in Brawley, and came under NCGRCD responsibility shortly after the establishment of NCGRCD in 1987. In the early 1990's, it was apparent that the Brawley station would be closed; the date palms were then repropagated beginning in 1993 and planted in CVARS. This location (Thermal) is better suited for the growth of date palms due to soils, weather conditions, etc.

Currently the date palms exist in both Thermal and Brawley. The status of the Brawley station is unclear, due to the complicated arrangement between the Federal government, the Imperial County government, and a private committee that was made when the site was originally established. It is currently maintained by the Imperial County Farmer's Committee (and is now called Imperial Valley Agricultural Research Station). The collection at Brawley needs major renovation/pruning at an estimated cost of about $20,000.

In CY 2005, no new date palm accessions were planted. However, several new potential accessions, received as tissue-cultured plantlets from INRA Antibes, are presently in quarantine. These will eventually be planted in the field for evaluation and possible accessioning. Repropagation of the main collection at CVARS has been completed. Due to the nature of date palms, this is a rather involved and intensive activity.

Germplasm Distributions

Distributions of germplasm from NCGRCD are summarized in Table 2 for the past three years. Distributions for the year 2005 totaled 815 accessions, 98 % of which were citrus. Most of the distributions (83% for citrus and 63% for dates) were to public agencies. Of the citrus distributions (799), 22% were distributed to domestic requestors, while 35% of the date distributions (16) were to domestic requestors; the remainder of the distributions was to foreign requestors. This is a significant increase in distributions (up from 493 in CY2003 and 235 in CY2004), but this is probably just a "blip" and not a general trend to more distributions.

The above figures are for all distributions, and include budwood, seed, pollen, leaves, DNA extracts, etc. Although NCGRCD is a clonal repository, it continues to distribute a fairly large amount of material as seeds. There are several reasons for this: many of the seeds distributed are used for virus indicators or in rootstock trials when requestors do not want to wait the years necessary for trees to start producing seeds when propagated from budwood; requestors wish to avoid quarantine hassles associated with vegetative tissue; and most distributions of citrus relatives are in the form of seeds since quarantine requirements are not well defined and the relatives generally come true-to-type form seed. Budwood distributions mostly fall in a few categories: production of seed sources of indicator plants for virus testing or production of rootstocks; establishment of a clean-source program; commercial trials; and a limited amount of breeding work.

During recent years, there have been increased numbers of domestic requests from researchers not affiliated with the major citrus-producing states, non-profit organizations (i.e., botanic gardens), and backyard or hobbyist growers. The NCGRCD tries to accommodate hobbyist growers (in contrast to many other Repositories), but this group accounts for a disproportionately large amount of effort considering the amount of germplasm actually distributed to them. This is primarily because they request small amounts of seeds of accessions from which seeds are not normally collected. All trees used as a source for seed distributions must now be check for CLBV, as it may be seed transmitted.

Databases

The NCGRCD uses several local databases as well as the national Germplasm Resources Information Network (GRIN) database maintained by the Database Management Unit (DBMU) of the National Germplasm Resources Laboratory (NGRL) in Beltsville. Review of the local databases is ongoing (see discussion in *Citrus Relatives* section above); this is necessary before corrections to the GRIN database can be made. Corrections to GRIN are generally made shortly after they are made in the local databases.

In addition to the review process, there have been several issues with the local databases that have needed resolution. A new format for inventory numbers has been instituted and most in house databases are now in Access format. In CY2006, we anticipate training in GRIN and Access, and will work to make sure the current inventory is in the GRIN database. It is hoped that at sometime in the future, a bar-coding or RFID system will be implemented to increase the efficiency for the inventory process. The core collection (see research section) has now been flagged in GRIN, and SSR marker data will be marked pending the establishment of a standard protocol.

The Repository web page < http://www.ars.usda.gov/main/site_main.htm?modecode=53103000 > can still be reached from the previous address: < http://www.ars-grin.gov/riv > is now the new standardized web format. Greater use of the website is being made for distribution of information. A slide show on the Repository is available at the FAO Ecoport site http://www.ecoport.org/EP.exe$PassCheckStart?ID=117. This should help spread the message that the Repository is here to serve the national and international research community.

Citrus Germplasm Activities

The NCGRCD is primarily a service unit, with its primary focus on providing others with the materials necessary to do research. Much of the research conducted at the Repository is in cooperation with University and USDA-ARS cooperating scientists. It is only in the past two years that a research scientist has been assigned to the Repository. Research and other activities supporting and enhancing the Repository's mission are described in this section.

During CY 2005, extramural funds were accessed for the development of a sampling method for detection of *Spiroplasma citri* in field trees received continued funding from CRB and the California Citrus Nursery Advisory Board.

One of the real strengths of the Riverside Repository, as compared to some of the other repositories, is the breadth of its program. Due to our status as a quarantine facility, we are able to directly introduce new accessions, and we also enjoy excellent cooperation with the CCPP. This is in contrast with other clonal repositories, which must introduce new materials through the National Plant Germplasm Quarantine Office in Beltsville. Our pathogen testing program and maintenance of materials under screen also allows us to offer pathogen-tested 'clean stock' material, which other repositories are unable to do. In the area of evaluation and research, the Riverside repository is active in several areas. In addition, we are active in the areas of horticulture and plant pathology in both the applied and basic research areas. The Repository also is closely involved in state and national phytosanitary issues due to participation in several committees.

Overall, this Repository, despite our small size and budget, has a program of which we are proud and which I believe can be favorably compared to other similar programs with greater resources and support.

Date Palm Activities

The Arizona State University (ASU) Arboretum in Tempe (Mr Richard Harris, Coordinator) has a collection of date palms that includes a few varieties not in the NCGRCD collection. The ASU collection has been threatened by development. This could potentially mean the loss (in the US) of those varieties not in the Repository collection. There are difficulties in obtaining these varieties due to California state quarantines. Date palms from outside the desert areas are restricted due to Palm Lethal Yellows mycoplasm, *Fusarium,* and *Ozonium.* The first two are not present in Arizona and would not prevent bringing date palms to the Cochella Valley. *Ozonium* is not known to occur in the Tempe area; however, it is difficult to certify this due to the complexity of the *Ozonium* assay. We are trying to find a way to import these varieties, and possibly a quarantine screenhouse at CVARS would enable this. Consequently, an application is being prepared for submission to CDFA for importation of these varieties.

RESEARCH

Molecular Characterization of the CVC

This project was cooperative with Dr Mikeal Roose, UCR Dept of Botany & Plant Science, and is supported by a SCA. Previously, an evaluation of the genetic diversity present in 380 sexually-derived accessions in the CVC was made by use of simple-sequence-repeat (SSR) markers. A core collection, a small subset containing the majority of the genetic diversity, was identified utilizing the SSR marker data. The core collection has been flagged as such in GRIN. Information regarding the primers developed is posted at http://www.plantbiology.ucr.edu/people/faculty/rooselink2.html . Following this earlier research, 28 representative cultivars were identified and five randomly selected gene segments (~1 Kb) were PCR amplified and direct sequenced. This information has been useful to identify single nucleotide polymorphisms (SNPs). This research is continuing.

Citrus leprosis disease

Citrus leprosis disease, vectored by *Brevipalpus sp.* mites, is an emerging disease in Central America. This disease, if the mite vector is not controlled, will kill citrus trees in three years. Until recently the only method for diagnosis of the disease was by transmission electron microscopy to visualize the virus-like particles in suspect samples. In cooperation with Dr. R. H. Brlansky and A. Guerra at the Citrus Research and Education Center, University of Florida, we have confirmed using molecular probes that there are two viruses associated with citrus leprosis disease which cause similar symptoms. One virus has a bipartite positive-sense RNA genome, occurs only in the cytoplasm of infected cells, and is the form that is spreading through Central America. The complete viral genome has been sequenced, and analyzed by computer analysis. The other virus is a rhabdo-like virus which occurs in the nucleus as well as in the cytoplasm of infected cells. For the cytoplasmic form of citrus leprosis virus, we have developed a more sensitive RT-PCR assay which targets a highly expressed viral RNA. The new detection method will provide a means to screen new accessions for this virus and will be useful to obtain new epidemiology information on this emerging disease.

Witches' Broom Disease of Lime (WBDL)

WBDL has almost eliminated acid lime production in Oman and nearby countries. This disease, caused by a phytoplasma, is thought to be vectored by a leaf hopper, and all acid limes planted in the field rapidly become infected on the northern coast of Oman. El-Kharbotly *et al.* (2000) first reported that WBDL may be seed transmitted. In cooperation with J. Hartung, Fruit Lab., BARC, Beltsville, MD, we planted seed collected from fruit from WBDL affected trees in the Quarantine Research Collection of Exotic Citrus Diseases (QRCECD). Thirty seven of 42 seedlings were positive for the WBDL phytoplasma. The seedlings are being monitored for appearance of witches' broom diseases symptoms.

In cooperation with Jude Grosser, Citrus Research and Education Center, University of Florida, we are evaluating eight somatic hybrids and acid lime hybrids in QRCECD for resistance and/or tolerance to WBDL. All lines being tested produce acid lime-like fruit and, if tolerant or resistant to WBDL, and could be potentially useful in re-establishing acid lime production in areas were WBDL is a limiting factor in the production of acid limes.

Other Phytoplasma Diseases of Citrus

Phytoplasmas were identified occurring with witches' broom symptoms in sweet orange trees in Visalia and Riverside areas, with trees showing bud proliferation symptoms near Redlands, and with trees expressing juvenility symptoms in Jamaica from budwood which had originated in California and Florida. Further characterization of the phytoplasmas is underway.

Dweet mottle virus/Citrus leaf blotch virus

In cooperation with UCR Department of Plant Pathology, the genome sequence of Dweet mottle virus (DMV) has been compared with the published sequence of *Citrus leaf blotch virus* (CLBV). The coat protein gene of DMV has been identified and inserted in an expression vector for the expression of a fusion protein which will be used to raise an antibody specific for DMV. Because of the close homology of sequence between DMV and CLBV, the antibody should also recognize CLBV. Trees in the Protected Collection, trees used for seed distribution, and common cultivars used for distribution by the Repository and the CCPP have been tested by RT-PCR for CLBV.

Development of Stable, Uniform non-infectious controls for use in CTV ELISA

Enzyme-linked immunosorbent assays (ELISA) are used extensively for detection of *Citrus tristeza virus* (CTV). The positive and negative controls used in ELISA vary greatly from laboratory to laboratory. Even in the same laboratory, there often is a lack of consistency over a period of time. We have developed a simple easy method to prepare standardized positive and negative controls which are relatively stable over a long period of time, even at room temperature. The use of such standards may permit better direct comparison among laboratories when comparing different ELISA systems for detection of CTV. Twenty-nine distributions of the controls for CTV ELISA were made in CY2005.

Development of sensitive diagnostic assays for stubborn disease

Stubborn disease of citrus, caused by *Spiroplasma citri* and spread by leafhoppers, is endemic in citrus areas having a Mediterranean-like climate and adversely affects trees by reducing yield and tree vigor, causing stunting which can be very severe in young trees. The acceptable diagnostic test to confirm stubborn is to culture the Spiroplasma. A rapid method for confirmation of the presence of stubborn has been developed by improving the method for extracting DNA from plant tissue and PCR of a conserved gene in the *S. citri* genome. This method allows sensitive detection of *S. citri* directly from tissue collected from trees in the field without having to culture the spiroplasma, and sensitivity of the detection method is greater than conventional culturing or the recently developed method of short culture times followed by extraction of DNA from the culture followed by PCR detection. The availability of this detection method will enable better monitoring of citrus nurseries and propagating materials to ensure freedom from the stubborn agent.

Nutrition of Date Palm

Leaves and fruit of date palms (*Phoenix dactylifera*) cv. 'Deglet Noor' grown under commercial conditions were assessed during the course of an entire growing season for nutrient levels of most macro- and micro-nutrients. The different nutrients showed various patterns in the different organs throughout the year. The data was compared with results from similar studies in other countries, particularly Egypt.

Facilities and Resources

At the end of CY2005, Repository facilities consisted of 538 ft^2 of laboratory space, 400 ft^2 of office space, 1375 ft^2 of headhouse space, 5948 ft^2 of greenhouse space, 16,200 ft^2 of screenhouse space, and 280 ft^2 storage space. Additional greenhouse space belonging to the University (three greenhouses and shared space in two additional greenhouses) is also used by the Repository. The laboratory is used for pathogen testing and elimination, research, and as a general work area for order processing, etc. Virus-tested potted trees belonging to our Protected Collection are maintained in the screenhouse. Greenhouse space is used for propagation, virus indexing, and maintenance of cold-sensitive germplasm (mostly citrus relatives).; one greenhouse on loan from UCR is used as a quarantine greenhouse. A 480 ft^2 office trailer provides office space and laboratory space for incubators, freezers, and the transfer hood utilized mainly for shoot tip grafting. The new addition of the screenhouse (completed in 2002) had the defective screen replaced in January 2005 at a cost of $31,000. While the upgrade of the greenhouses (2001-2002) and enlargement of the screenhouse (2002-2003) has been completed, we have already outgrown the capacity of these facilities.

The major upgrade of the facilities during CY2005 was the purchase of a new growth chamber, installed on the south side of the trailer.

Personnel

During 2005, Repository (permanent, full-time) staffing was 2.0 SY: Research

Leader/Research Plant Pathologist and Horticulturist/Curator, and 4 FTE Biological Technicians. These positions were supplemented with a 0.75 FTE Office Assistant 'term' (temporary) position, a 0.25 FTE Biological Technician, two post-doctoral researchers, and approximately 2.0 FTE student and casual positions hired through the UCR via the RSA. Additionally two graduate students from Plant Pathology, Subhas Hajeri and Amandeep Singh Kahlon, have taken thesis research projects relating to the mission of the repository, and do most of their research in the Repository.

The Research Leader, R. Lee, is the only category 1 scientist in the unit, and his research has been directed at development of new or improved diagnostic techniques for citrus pathogens to strengthen the ability of the Repository to provide the highest quality pathogen-tested germplasm.

The Location support for the Repository is provided by the Location personnel housed in the US Salinity Laboratory. Administrative support from the PWA Area Office is under the direction of the Area Director, Dr D Buxton, with able assistance from Dr. Andrew Hammond, Associate Area Director, and Dr. Robert Matteri, Assistant Area Director.

Major Issues

The most critical issue facing the Repository at the end of CY2005 is space. The laboratory space is very crowded, and will become more crowded in the foreseeable future. We have been dealing with this by moving the growth chamber to the breezeway and converting the previous space in the headhouse to a dark room, work benches and cabinets, and creating a space for use for sample extractions to free up an equivalent area in the laboratory. One transfer hood has been moved to the trailer which also houses two freezers, two incubators, the break area, the copy machine, and offices for four persons.

While the screenhouse which houses our Protected Collection was completed recently (CY2002), we will reach capacity in this expanded space within CY2006. The shortage of greenhouse space has been temporarily helped by being able to borrow the use of greenhouse space from UCR, these have the disadvantage of not being able to make improvements to the structures because they do not belong to the USDA, and they are not adjacent to the core collection of buildings which are serviced by the back-up generator in case of prolonged power failure. This puts our collection of citrus relatives at risk of loss because they are almost totally housed in borrowed greenhouses.

Instead of about 20-25 accessions/year which has been about average, this last year about 70 accessions were realized. To continue the increased activity on accessions, especially therapy and testing for freedom of the graft-transmissible pathogens, requires increased greenhouse space and growth chamber space. Crowding the accessions in the screenhouse make distributions more difficult and greatly increases the chance of cutting budwood from the wrong plant.

Additionally, the Florida Department of Agriculture and Consumer Affairs now recognize the high quality of the germplasm maintained in the Repository's Protected Collection.

They now access germplasm from the Protected Collection, once received in Florida it may be fast track introduced in the Florida budwood program which involves a thermotherapy cycle, followed by biological indexing for freedom from psorosis and psorosis-like pathogens and from viroids, and verification of freedom from CTV by ELISA. This permits introduction into the Florida Budwood Certification Program about a year. Because of this, the Repository can now be truly a National Clonal Germplasm Repository, and can help with the clean up of accessions which are requested by Florida. This status enables the Repository to better fulfill our mission, but at the same time highlights the lack of physical facilities at the repository. Our goal is to be able to release 70 accessions from quarantine on a yearly basis, but to do this, additional resources (labor and facilities) would be needed.

Requests have been made as a combined request for small building from several Repositories: the request from the Repository was for additional greenhouse and screenhouse space. Additionally, we have draft plans for an office/conference/growth facility which would include four growth rooms, one for quarantine use, one for cool temperature indexing, one for warm temperature indexing, and one for use for thermotherapy.

Publications

Refereed:

Villalobos, W., L. Moreira, K.S. Derrick, M.J.G. Beretta, R.F. Lee, and C. Rivera. 2005. First report of citrus blight in Costa Rica. Plant Disease 89:108.

Lee, R.F., M.G.H. Dekkers, and M. Bar-Joseph. 2006. Development of stable, uniform antigen controls for use in ELISA assays for Citrus tristeza virus. Accepted as a refereed paper in the Proc. 16th Conf. IOCV.

Palmieri, M., I. Donis, A. L. Salazar, N. Cruz, A. Paniagua, R. H. Brlansky, A. Guerra-Moreno, K. L. Manjunath, P. Ballance, and R. F. Lee. 2006. Citrus viruses in Guatemala: Application of laboratory-based assays. Accepted as a refereed paper in the Proc. 16th Conf. IOCV.

Guerra-Moreno, A.S., K.L. Manjunath, R.H. Brlansky, and R.F. Lee. 2006. Citrus leprosis symptoms can be associated with the presence of two different viruses: cytoplasmic and nuclear, the former having a multipartite RNA genome. Accepted as a refereed paper in the Proc. 16th Conf. IOCV.

Ramos, C., J. C. Castillo, O. Fernández, B. Rangel, K. L. Manjunath, and R. F. Lee. 2006. Molecular characterization of Citrus tristeza virus isolates from Panama. Accepted as a refereed paper in the Proc. 16th Conf. IOCV.

P. J. Sieburth, P.J., K.G. Nolan, M.E. Hilf, R.F. Lee, P. Moreno, and S.M. Garnsey. 2006. Discrimination of stem-pitting Citrus Tristeza Virus isolates from other CTV isolates. Accepted as a refereed paper in the Proc. 16th Conf. IOCV.

Roy, A., K. L. Manjunath, and R. H. Brlansky. 2005. Assessment of sequence diversity in the 5' terminal region of *Citrus tristeza virus* from India. Virus Research 113:132-142.

Non-refereed papers:
Krueger, R.R., J. Bash, and R.F. Lee. 2005. Dweet mottle virus and Citrus leaf blotch virus. Subtropical Fruit News 3(1):7-9.

Krueger, R.R., J. Bash, B. Rangel, and R.F. Lee. 2005. Citrus leaf blotch virus in California. (IOCV Newsletter)

T. Putter, R. Putter, R.F. Lee,and C.N. Roistacher. 2006. EcoPort slide shows on the internet. Accepted as a short non-refereed paper for Proc. 16th Conf. IOCV.

Krueger, R.R., J. Bash, and R.F. Lee. 2006. Phytosanitary status of California citrus. Accepted as a short non-refereed paper for Proc. 16th Conf. IOCV.

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Rangel, B. and R. F. Lee. 2005. Phytoplasmas in Citrus. Phytopathology 95:S86.

Hajeri, S., B. Rangel, and R. F. Lee. 2005. Dweet Mottle Disease and Citrus Leaf Blotch Disease may be caused by same virus or different strains of same virus. Phytopathology 95:S39.

Ramos, C., C.N. Roistacher, G.W. Muller, K. Bederski, B. Rangel, and R. F. Lee. 2006. Molecular characterization of Citrus tristeza virus isolates from mild strain cross protection experiments in Peru. Abstract to be published in Proc. 16th Conf. IOCV.

Rangel, B., R.R. Krueger, and R. F. Lee. 2006. Current research on *Spiroplasma citri* in California. Abstract accepted to be published in Proc. 16th Conf. IOCV.

Guerra-Moreno, A.S., K.L. Manjunath, R.F. Lee, and R.H. Brlansky. 2005. Citrus leprosis disease is associated with a bipartite positive-sense RNA virus. 2005 Caribbean Division meeting of APS, Costa Rica, June 2005.

Manjunath, K.L., E. Rangel, A.S. Guerra-Moreno, R.H. Brlansky, and R.F. Lee. 2005. Serological detection of the cytoplasmic Citrus leprosis virus (CiLV) from infected citrus plants. 2005 Caribbean Division meeting of APS, Costa Rica, June 2005.

El-Assar AM, Krueger RR, Devanand PS, Chao CT. 2005. Genetic analysis of Egyptian date (*Phoenix dactylifera* L.) accessions using AFLP markers. Genetic Resources and Crop Evolution 52:601-607.

Table 1. Material held under Quarantine

USDA-ARS-NCGRCD
Riverside, California

Accessions Held under Departmenal Permit 62789

1/23/2006

	Quarantine Report 2005									
Acc No	other ID	Cultivar	group	source	date rec'd	form rec'd	Quar type	Quar status	Index	Comments
RRUT 149	RQ-2001-04 (NCGRCD); Q-25443 (USDA-PGQO)	Goutoucheng (4-1)	sour orange	PR China, via PGQO, CCPP	02/2001	budwood	International	held	not yet	CTV+ (pre-index)
RRUT 150	RQ-2001-05 (NCGRCD); Q-25451 (USDA-PGQO)	Caoshixiangju (1-11-12)	mandarin	PR China, via PGQO, CCPP	02/2001	budwood	International	held	not yet	CTV+ (pre-index)
RRUT 151	RQ-2001-06 (NCGRCD); Q-25454 (USDA-PGQO)	Caoju (1-18-47)	mandarin	PR China, via PGQO, CCPP	02/2001	budwood	International	held	not yet	CTV+ (pre-index)
RRUT 152	RQ-2001-07 (NCGRCD); Q-25455 (USDA-PGQO)	Fuju (1-10-17)	mandarin	PR China, via PGQO, CCPP	02/2001	budwood	International	held	not yet	CTV+ (pre-index)
RRUT 153	RQ-2001-08 (NCGRCD); Q-25458 (USDA-PGQO)	Beibeiyou (15-3)	pummelo	PR China, via PGQO, CCPP	02/2001	budwood	International	held	I2001-36	Apparently clean; needs confirming sPAGE.
RRUT 154	RQ-2001-09 (NCGRCD); Q-25460 (USDA-PGQO)	Shatianyou (2-1)	pummelo	PR China, via PGQO, CCPP	02/2001	budwood	International	held	I2001-37	Apparently clean; needs confirming sPAGE.
RRUT 155	RQ-2001-10 (NCGRCD); Q-25464 (USDA-PGQO)	un-named trifoliate ex-Beibei	trifoliate	PR China, via PGQO, CCPP	02/2001	budwood	International	held	not yet	CEVd + (citron) (pre-index)
RRUT 156	RQ-2001-11(NCGRCD); Q-26712 (USDA-PGQO)	un-named lemon (?) ex-Tibet	lemon (?)	Nepal, via PGQO, CCPP	02/2001	budwood	International	held	not yet	
RRUT 157	RQ-2001-12 (NCGRCD); Q-26713 (USDA-PGQO)	un-named sweeet orange (?) ex-Tibet	sweet orange (?)	Nepal, via PGQO, CCPP	02/2001	budwood	International	held	not yet	

Acc_No	other_ ID	Cultivar	group	source	date_rec'd	form_rec'd	Quar_type	Quar_status	Index	Comments
RRUT 158	RQ-2001-13 (NCGRCD); Q-26717 (USDA-PGQO)	un-named lemon (?) ex-Tibet	lemon (?)	Nepal, via PGQO, CCPP	02/2001	budwood	International	held	not yet	CTV + (pre-index)
RRUT 159	RQ-2001-14 (NCGRCD); Q-26718 (USDA-PGQO)	un-named sweeet orange (?) ex-Tibet	sweet orange (?)	Nepal, via PGQO, CCPP	02/2001	budwood	International	held	not yet	
RRUT 160	RQ-2001-15 (NCGRCD); Q-26719 (USDA-PGQO)	un-named lemon (?) ex-Tibet	lemon (?)	Nepal, via PGQO, CCPP	02/2001	budwood	International	held	not yet	
RRUT 161	RQ-2001-16 (NCGRCD); Q-26720 (USDA-PGQO)	un-named lemon (?) ex-Tibet	lemon (?)	Nepal, via PGQO, CCPP	02/2001	budwood	International	held	not yet	
RRUT 162	RQ-2001-17 (NCGRCD); Q-26725 (USDA-PGQO)	un-named lemon (?) ex-Tibet	lemon (?)	Nepal, via PGQO, CCPP	02/2001	budwood	International	held	not yet	
RRUT 163	RQ-2001-18 (NCGRCD); Q-26728 (USDA-PGQO) (note: this Q number -	un-named sweeet orange (?) ex-Tibet	sweet orange (?)	Nepal, via PGQO, CCPP	02/2001	budwood	International	held	not yet	CTV + (pre-index)
RRUT 164	RQ-2001-19 (NCGRCD); Q-26730 (USDA-PGQO) (note: this Q number -	un-named mandarin (?) ex-Tibet	mandarin (?)	Nepal, via PGQO, CCPP	02/2001	budwood	International	held	not yet	CEVd + (citron) (pre-index)
RRUT 165	RQ-2001-20 (NCGRCD); Q-26733 (USDA-PGQO)	un-named lemon (?) ex-Tibet	lemon (?)	Nepal, via PGQO, CCPP	02/2001	budwood	International	held	not yet	
RRUT 178	RQ-2001-34 (NCGRCD)	Fuming Evergreen Trifoliate	trifoliate	PR China via CCPP	02/2001	budwood	International	held	not yet	CTV + (pre-index)
RRUT 191	RQ-2001-54 (NCGRCD); IVIA-C359	Citrus daoxianensis	mandarin	IVIA, Valencia, Spain	06/2001	budwood	International	held	I2002-21,22	Apparently clean; needs confirming sPAGE.

Acc_No	other_ ID	Cultivar	group	source	date_rec'd	form_rec'd	Quar_type	Quar_status	Index	Comments
RRUT 192	RQ-2001-55 (NCGRCD)	Citrus macroptera	papeda	IVIA, Valencia, Spain	06/2001	budwood	International	held	not yet	
RRUT 193	RQ-2001-56 (NCGRCD)	Citropsis noldae	citrus relative	IVIA, Valencia, Spain	06/2001	budwood	International	discarded		did not establish
RRUT 196	RQ-2002-07 (NCGRCD)	pummelo #1 ex-Sichuan	pummelo	PR China	01/2002	budwood	International	held	not yet	
RRUT 197	RQ-2002-08 (NCGRCD)	pummelo #2 ex-Sichuan	pummelo	PR China	01/2002	budwood	International	held	not yet	
RRUT 198	RQ-2002-09 (NCGRCD)	pummelo #3 ex-Sichuan	pummelo	PR China	01/2002	budwood	International	held	not yet	
RRUT 205	RQ-2003-01 (NCGRCD)	cv vareigata	lime	D Hach, Berlin, Germany	04/2003	budwood	International	held	not yet	
RRUT 206	RQ-2003-02 (NCGRCD)	cv vareigata	trifoliate	D Hach, Berlin, Germany	04/2003	budwood	International	discarded		did not establish
RRUT 207	RQ-2003-03 (NCGRCD)	Microcitrus garrowayii	microcitrus	D Hach, Berlin, Germany	04/2003	budwood	International	held	not yet	
RRUT 208	RQ-2003-04 (NCGRCD)	Limone Cardinale (?)	lemon or lemon hybrid	D Hach, Berlin, Germany	04/2003	budwood	International	discarded		did not establish
RRUT 209	RQ-2003-05 (NCGRCD)	Caniculata	lemon or lemon hybrid	D Hach, Berlin, Germany	04/2003	budwood	International	held	not yet	

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RRUT 210	RQ-2003-06 (NCGRCD)	Cedrato di Lúcca	lemon or lemon hybrid	D Hach, Berlin, Germany	04/2003	budwood	International	discarded		did not establish
RRUT 211	RQ-2003-07 (NCGRCD)	Limone di Gaza lungho	lemon or lemon hybrid	D Hach, Berlin, Germany	04/2003	budwood	International	discarded		did not establish
RRUT 212	RQ-2003-08 (NCGRCD)	Limone Castello	lemon	D Hach, Berlin, Germany	04/2003	budwood	International	discarded		did not establish
RRUT 213	RQ-2003-09 (NCGRCD)	Kotidiana (Cotidiana)	sweet orange	D Hach, Berlin, Germany	04/2003	budwood	International	discarded		did not establish
RRUT 214	RQ-2003-10 (NCGRCD)	Horned Bergamot (cupl)	sour orange	D Hach, Berlin, Germany	04/2003	budwood	International	discarded		did not establish
RRUT 215	RQ-2003-11 (NCGRCD)	Horridus	sour orange	D Hach, Berlin, Germany	04/2003	budwood	International	discarded		did not establish
RRUT 216	RQ-2003-12 (NCGRCD)	Virgatum (Braghe tedesce)	sour orange	D Hach, Berlin, Germany	04/2003	budwood	International	discarded		did not establish
RRUT 217	RQ-2003-13 (NCGRCD)	Varia (salicifolia)	sweet orange	D Hach, Berlin, Germany	04/2003	budwood	International	discarded		did not establish
RRUT 232	IVIA-416	Citropsis noldae	citrus relative	IVIA, Valencia, Spain	04/2004	budwood	International	discarded		did not establish
RRUT 233	IVIA-180	Aegle marmelos	citrus relative	IVIA, Valencia, Spain	04/2004	budwood	International	discarded		did not establish

Acc_No	other_ID	Cultivar	group	source	date_rec'd	form_rec'd	Quar_type	Quar_status	Index	Comments
PI 133261	RQ-2001-45 (NCGRCD);ahw-93-8; af-62-461(USDA-ARS-HRL)	Bahianinha	sweet orange - navel	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	held	not yet	CTV + (pre-index)
PI 230622	RQ-2001-48(NCGRCD); PQX 48780 (USDA); ahw-94-33; 79-407	Gioia Tauro	sweet orange	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	held	I2002-17,18	Apparently clean; needs confirming sPAGE.
PI 265834	RQ-2001-49 (NCGRCD); ahw-93-226; af-61-5 (USDA-ARS-HRL)	M'guerqueb	citron	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	held	I2002-19,20	Apparently clean; needs confirming sPAGE.
PI 280540	RQ-2001-28 (NCGRCD)	Tamurana	pummelo	Rio Farms, Monte Alto, Texas via CCPP	02/2001	budwood	Interstate	held	I2001-38	Apparently clean; needs confirming sPAGE.
RRUT 037	RQ-2001-52 (NCGRCD)	Wilson's lemon	lemon	Longwood Gardens, Pennsylvania via OJ Bier	03/2001	budwood	Interstate	held	not yet	CTV + by donor
RRUT 166	RQ-2001-21 (NCGRCD); F-6-9-10 (USDA, Orlando)	Clementine X Orlando	mandarin	Rio Farms, Monte Alto, Texas via CCPP	02/2001	budwood	Interstate	held	I2002-09,10	Apparently clean; needs confirming sPAGE.
RRUT 167	RQ-2001-22 (NCGRCD); C54-4-2 (USDA, Indio)	Clementine X Murcott	mandarin	Rio Farms, Monte Alto, Texas via CCPP	02/2001	budwood	Interstate	held	not yet	CEVd + (citron) (pre-index)
RRUT 168	RQ-2001-23 (NCGRCD); C61-252 (USDA, Indio)	Shekwasha X Koethen	mandarin	Rio Farms, Monte Alto, Texas via CCPP	02/2001	budwood	Interstate	held	not yet	CEVd + (citron) (pre-index)
RRUT 169	RQ-2001-24 (NCGRCD); RKO #6	Rico #6	sweet orange	Rio Farms, Monte Alto, Texas via CCPP	02/2001	budwood	Interstate	held	not yet	CEVd + (citron) (pre-index)
RRUT 170	RQ-2001-25 (NCGRCD)	Red Mexican	grapefruit	Rio Farms, Monte Alto, Texas via CCPP	02/2001	budwood	Interstate	held	not yet	CEVd + (citron), Ps + (pre-index)

Acc_No	other_ ID	Cultivar	group	source	date_rec'd	form_rec'd	Quar_type	Quar_status	Index	Comments
RRUT 171	RQ-2001-26 (NCGRCD)	Variant Citradia	citradia	Rio Farms, Monte Alto, Texas via CCPP	02/2001	budwood	Interstate	held	I2001-11,12	Apparently clean; needs confirming sPAGE.
RRUT 172	RQ-2001-27 (NCGRCD)	Sarah #2	sweet orange	Rio Farms, Monte Alto, Texas via CCPP	02/2001	budwood	Interstate	held	I2003-22,23	Apparently clean; needs confirming sPAGE.
RRUT 173	RQ-2001-29 (NCGRCD)	Iwaikan	pummelo	Rio Farms, Monte Alto, Texas via CCPP	02/2001	budwood	Interstate	held	I2001-39	Apparently clean; needs confirming sPAGE.
RRUT 174	RQ-2001-30 (NCGRCD)	Ling Mung	rangpur	Rio Farms, Monte Alto, Texas via CCPP	02/2001	budwood	Interstate	held	I2001-40	Apparently clean; needs confirming sPAGE.
RRUT 175	RQ-2001-31 (NCGRCD)	Tomango	sweet orange - blood	Rio Farms, Monte Alto, Texas via CCPP	02/2001	budwood	Interstate	held	not yet	CEVd + (citron) (pre-index)
RRUT 176	RQ-2001-32 (NCGRCD)	Red Ling Mung	rangpur	Rio Farms, Monte Alto, Texas via CCPP	02/2001	budwood	Interstate	held	I2001-41	Apparently clean; needs confirming sPAGE.
RRUT 177	RQ-2001-33 (NCGRCD)	Long Huang Kat	mandarin	Rio Farms, Monte Alto, Texas via CCPP	02/2001	budwood	Interstate	held	not yet	CEVd + (citron) (pre-index)
RRUT 179	RQ-2001-36 (NCGRCD); ahw-93-125; af-62-72 (USDA-ARS-HRL)	Navel grapefuit	grapefruit	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	discarded	not yet	duplicate of existing accession
RRUT 180	RQ-2001-37 (NCGRCD); USDA-9-6-36; ahw-94-37 (USDA-ARS-HRL); dpi-800-	Sunstar	sweet orange	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	held	I2001-34	Apparently clean; needs confirming sPAGE.
RRUT 181	RQ-2001-38 (NCGRCD)	USDA-10-8 (Seedless Pineapple)	sweet orange	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	held	not yet	CTV + (pre-index)

Acc_No	other_ID	Cultivar	group	source	date_rec'd	form_rec'd	Quar_type	Quar_status	Index	Comments
RRUT 182	RQ-2001-39 (NCGRCD); ahw-93-181; af-62-239 (USDA-ARS-HRL)	Succari	sweet orange - acidless	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	held	not yet	CTV + (pre-index)
RRUT 183	RQ-2001-40 (NCGRCD)	Cooper	sweet orange - navel	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	held	I2003-21	CTV+; to thermo-therapy
RRUT 184	RQ-2001-42 (NCGRCD); ahw-94-4; 77-153 (USDA-ARS-HRL)	Bahianinha Monte Parnazo	sweet orange - navel	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	held	not yet	
RRUT 185	RQ-2001-43 (NCGRCD); ahw-94-26; 79-65(USDA-ARS-HRL)	Tung Kum	mandarin	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	held	I2002-13,14	Apparently clean; needs confirming sPAGE.
RRUT 186	RQ-2001-44 (NCGRCD); USDA-9-6-1; ahw-94-34 (USDA-ARS-HRL); dpi-800-	Midsweet	sweet orange	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	held	not yet	CTV + (pre-index)
RRUT 187	RQ-2001-46 (NCGRCD); USDA-9-8-15; ahw-94-32 (USDA-ARS-HRL); dpi-800-	Gardner	sweet orange	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	held	not yet	CTV + (pre-index)
RRUT 188	RQ-2001-47 (NCGRCD); CPB 52016-k-2 (USDA-CPB); ahw-93-189; 79-	Swingle	tangelo	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	held	I2002-15,16	Apparently clean; needs confirming sPAGE.
RRUT 189	RQ-2001-50 (NCGRCD); ahw-94-18; 77-162 (USDA-ARS-HRL)	Murcott nearly seedless	mandarin	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	held	not yet	
RRUT 190	RQ-2001-51(NCGRCD)	Tresca	sweet orange	USDA-ARS-HRL via CCPP	02/2001	budwood	Interstate	held	I2001-35	CTV+; to thermo-therapy.
RRUT 201	RQ-2002-27 (NCGRCD); FF1-132-46, HRS-812 (USDA-ARS-HRL); DPI-814-	US-812	trifoliate hybrid - citrandarin	Florida DPI, Winterhaven, Florida	10/2002	budwood	Interstate	held	I2003-34	needs warm temp indexing & sPAGE

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RRUT 202	RQ-2002-28 (NCGRCD); DPI-814 (FL DPI)	US-852	trifoliate hybrid - citrandarin	Florida DPI, Winterhaven, Florida	10/2002	budwood	Interstate	discarded		did not establish
RRUT 203	RQ-2002-31 (NCGRCD); ahw-94-51; af-64-15;if-63-62 (USDA-ARS-HRL)	Gainesville 71	trifoliate	USDA-ARS-HRL, Ft Pierce, Florida	11/2002	budwood	Interstate	held	not yet	
RRUT 204	RQ-2002-32 (NCGRCD); ahw-94-115; af-62-173 (USDA-ARS-HRL); CPB 777	Willits	trifoliate hybrid - citrange	USDA-ARS-HRL, Ft Pierce, Florida	11/2002	budwood	Interstate	discarded		did not establish
RRUT 218	RQ-2003-14 (NCGRCD)	US-852	trifoliate hybrid - citrandarin	Florida DPI, Winterhaven, Florida	07/2003	budwood	Interstate	discarded		did not establish
RRUT 219	RQ-2003-15 (NCGRCD)	US-852	trifoliate hybrid - citrandarin	Florida DPI, Winterhaven, Florida	09/2003	budwood	Interstate	held	not yet	
RRUT 224		USDA 77-19	pending receipt of passport data	USDA-ARS-HRL, Ft Pierce, Florida	04/2004	budwood	Interstate	discarded		did not establish
RRUT 225		USDA 37-12	pending receipt of passport data	USDA-ARS-HRL, Ft Pierce, Florida	04/2004	budwood	Interstate	discarded		did not establish
RRUT 226		USDA 74-15	pending receipt of passport data	USDA-ARS-HRL, Ft Pierce, Florida	04/2004	budwood	Interstate	discarded		did not establish
RRUT 227	79-66 (USDA-ARS-HRL)	Szewui	mandarin	USDA-ARS-HRL, Ft Pierce, Florida	04/2004	budwood	Interstate	held	not yet	
RRUT 228	80-52 (USDA-ARS-HRL)	Kalpi	lime	USDA-ARS-HRL, Ft Pierce, Florida	04/2004	budwood	Interstate	discarded		did not establish

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RRUT 229	PI 230106	C assamensis	lemon	USDA-ARS-HRL, Ft Pierce, Florida	04/2004	budwood	Interstate	discarded		did not establish
RRUT 230	PI 77599	Miaray	mandarin	USDA-ARS-HRL, Ft Pierce, Florida	04/2004	budwood	Interstate	discarded		did not establish
RRUT 231	IVIA-355	Clemelin 11-20	tangor	IVIA, Valencia, Spain	04/2004	budwood	Interstate	discarded		did not establish
CRC 4085	RQ-2001-62 (NCGRCD)	Malta	sweet orange - blood orange	Ed Patterson, Redlands, Calif via OJ Bier	08/2001	budwood	Intrastate	held	I2002-23,24	CTV+; CEVd+; to thermo-therapy and/or STG
PI 038388		C pennivesiculata	lemon hybrid	Citrus Variety Collection, UC Riverside	11/1993	budwood	Intrastate	held	I2000-28	Apparently clean; needs confirming sPAGE.
PI 132372		Ugli	tangor	Citrus Variety Collection, UC Riverside	03/1991	budwood	Intrastate	held	I2001-03	Apparently clean; needs confirming sPAGE.
PI 214467		H-56	tangor	Citrus Variety Collection, UC Riverside	10/2002	budwood	Intrastate	held	I2003-16	needs warm temp indexing & sPAGE
PI 218009		Lunario	lemon	Citrus Variety Collection, UC Riverside	03/1991	budwood	Intrastate	held	I2000-31	Apparently clean; needs confirming sPAGE.
PI 296321		Kaisum wampee	citrus relative	unregistered CCPP tree	04/1986	budwood	Intrastate	held	I2001-45	Apparently clean; needs confirming sPAGE.
PI 539161		Brazilian	sour orange	Citrus Variety Collection, UC Riverside	03/1993	budwood	Intrastate	held	I2000-04	Apparently clean; needs confirming sPAGE.

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PI 539178		C benikoji	tangor	Citrus Variety Collection, UC Riverside	11/1993	budwood	Intrastate	held	I2001-27	Apparently clean; needs confirming sPAGE.
PI 539195		C funadoko	tangelo	Citrus Variety Collection, UC Riverside	06/1985	budwood	Intrastate	held	I2000-30	Apparently clean; needs confirming sPAGE.
PI 539251		C ichangensis	papeda	Citrus Variety Collection, UC Riverside	03/1987	budwood	Intrastate	held	I2000-01	Apparently clean; needs confirming sPAGE.
PI 539268		Florida	rough lemon	Citrus Variety Collection, UC Riverside	1991	budwood	Intrastate	held	I2000-02	Apparently clean; needs confirming sPAGE.
PI 539468		Wheeny	grapefruit	Citrus Variety Collection, UC Riverside	09/1994	budwood	Intrastate	held	I2001-02	Apparently clean; needs confirming sPAGE.
PI 539493		Hung kat	mandarin	Citrus Variety Collection, UC Riverside (STG	03/1991	budwood	Intrastate	held	I2000-16	Apparently clean; needs confirming sPAGE.
PI 539543		USDA 88-3	mandarin	unregistered CCPP tree	01/1998	budwood	Intrastate	held	I2001-25	Apparently clean; needs confirming sPAGE.
PI 539626		Hamlin	sweet orange	Citrus Variety Collection, UC Riverside	11/1993	budwood	Intrastate	held	I2000-07	Apparently clean; needs confirming sPAGE.
PI 539628		Pera	sweet orange	Citrus Variety Collection, UC Riverside	03/1991	budwood	Intrastate	held	I2000-15	Apparently clean; needs confirming sPAGE.
PI 539651		Jaffa	sweet orange	Citrus Variety Collection, UC Riverside	04/1983?	budwood	Intrastate	held	I2000-18	Apparently clean; needs confirming sPAGE.

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PI 539677		C sulcata	grapefruit hybrid	Citrus Variety Collection, UC Riverside	11/1993	budwood	Intrastate	held	I2000-29	Apparently clean; needs confirming sPAGE.
PI 539678		C sunki	mandarin	Citrus Variety Collection, UC Riverside	10/1990	budwood	Intrastate	held	I2000-03	Apparently clean; needs confirming sPAGE.
PI 539838		Arajon	pummelo	Citrus Variety Collection, UC Riverside	11/1993	budwood	Intrastate	held	I2000-32	Apparently clean; needs confirming sPAGE.
PI 600668		Dart I (North)	mandarin - satsuma	unregistered CCPP tree	08/1993	budwood	Intrastate	held	I2001-22	Apparently clean; needs confirming sPAGE.
PI 600669		Dungan	mandarin - satsuma	unregistered CCPP tree	08/1993	budwood	Intrastate	held	I2000-08	Apparently clean; needs confirming sPAGE.
RCRC 3982		Xianfengcheng	sweet orange	unregistered CCPP tree	01/1998	budwood	Intrastate	held	I2001-26	Apparently clean; needs confirming sPAGE.
RCRC 3983		Jincheng	sweet orange	unregistered CCPP tree	01/1998	budwood	Intrastate	held	I2001-24	Apparently clean; needs confirming sPAGE.
RCRC 4048	RQ-1999-03 (NCGRCD)	Tavares	kumquat hybrid	OJ Bier, Riverside, Calif	10/1999	budwood	Intrastate	held	I2000-17	Apparently clean; needs confirming sPAGE.
RCRC 4098		McEwen	mandarin - satsuma	unregistered CCPP tree	08/1993	budwood	Intrastate	held	I2000-10	Apparently clean; needs confirming sPAGE.
RCRC 4100		Dart I (South)	mandarin - satsuma	unregistered CCPP tree	10/1993	budwood	Intrastate	held	I2001-23	Apparently clean; needs confirming sPAGE.

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RCRC 4102		Road 164	mandarin - satsuma	unregistered CCPP tree	10/1993	budwood	Intrastate	held	I2000-09	Apparently clean; needs confirming sPAGE.
RCRC 4104	C1993-10 (NCGRCD)	Chinotto broadleaf variant	sour orange hybrid	Citrus Variety Collection, UC Riverside	12/1993	budwood	Intrastate	held	I2000-05	Apparently clean; needs confirming sPAGE.
RRUT 021	RQ-1997-07 (NCGRCD)	Brawley	mandarin	USDA Field Station, Brawley, Calif	10/1997	budwood	Intrastate	held	I2000-14	Apparently clean; needs confirming sPAGE.
RRUT 030	RQ-1998-47 (NCGRCD)	C macrophylla	papeda hybrid	GH 1623, UC Riverside	09/1998	budwood	Intrastate	held	not yet	
RRUT 031	RQ-1993-07 (NCGRCD)	Ruby 4N	sweet orange - blood orange	Field 6, CRC, Riverside	08/1993	budwood	Intrastate	held	not yet	
RRUT 032	RQ-1993-08 (NCGRCD)	Temple 4N	tangor	Field 6, CRC, Riverside	08/1993	budwood	Intrastate	held	not yet	
RRUT 034	RQ-2002-20 (NCGRCD)	Aebi	lemon	Dr & Mrs Aebi, Pasadena, Calif via OJ Bier	05/2002	budwood	Intrastate	held	not yet	
RRUT 035	RQ-2001-61 (NCGRCD)	Dayap Philippine lime	lime	N Zamora, Rosemead, Calif via OJ Bier	07/2001	budwood	Intrastate	held	I2002-25,26	CTV+; to thermo-therapy
RRUT 036	RQ-1999-05 (NCGRCD)	Collins-Hibbert	sweet orange	Collins Ranch, Live Oak, Calif	12/1999	budwood	Intrastate	held	I2003-12,13	needs warm temp indexing & sPAGE
RRUT 113	RQ-1989-01 (NCGRCD)	Little Sweetie	lemon - sweet lemon	Collected by T Williams in San Diego Cty, California	06/1989	budwood	Intrastate	held	I2000-12	VE+; TL+; STG trees need testing

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RRUT 140	RQ-1999-04 (NCGRCD)	Bidwell's Bar	sweet orange	from orig tree, Butte Cty, California	12/1999	budwood	Intrastate	held	I2003-14,15	needs warm temp indexing & sPAGE
RRUT 141	RQ-2000-12 (NCGRCD)	Webber shaddock	pummelo	Jensen's Date Garden, Indio, California	08/2000	budwood	Intrastate	held	not yet	
RRUT 142	RQ-2000-13 (NCGRCD)	Pursha lime	?	Jensen's Date Garden, Indio, California	08/2000	budwood	Intrastate	held	not yet	
RRUT 143	RQ-2000-14 (NCGRCD)	Hawaiian pummelo	pummelo	Jensen's Date Garden, Indio, California	08/2000	budwood	Intrastate	held	not yet	
RRUT 144	RQ-2000-15 (NCGRCD)	Palestine (?)	sweet lime	Jensen's Date Garden, Indio, California	08/2000	budwood	Intrastate	held	not yet	
RRUT 145	RQ-2000-16 (NCGRCD)	Eureka	lemon	Jensen's Date Garden, Indio, California	08/2000	budwood	Intrastate	held	not yet	
RRUT 146	RQ-2000-17 (NCGRCD)	Limequat	kumquat hybrid	Jensen's Date Garden, Indio, California	08/2000	budwood	Intrastate	held	not yet	
RRUT 147	RQ-2000-18 (NCGRCD)	Lisbon lime	lime (?)	Jensen's Date Garden, Indio, California	08/2000	budwood	Intrastate	held	not yet	
RRUT 148	RQ-2000-19 (NCGRCD)	Shamel tangor	tangor (?)	Jensen's Date Garden, Indio, California	08/2000	budwood	Intrastate	held	not yet	
RRUT 199	RQ-2002-18	Fukushu	kumquat	Willits & Newcomb, Arvin, Calif via OJ Bier (registered	02/2002	budwood	Intrastate	held	I2003-05,06	needs warm temp indexing & sPAGE

Acc_No	other_ ID	Cultivar	group	source	date_rec'd	form_rec'd	Quar_type	Quar_status	Index	Comments
RRUT 200	RQ-2002-26 (NCGRCD)	Bitters Newhall	sweet orange - navel	Field 12C, CRC,Riverside,Calif	06/2002	budwood	Intrastate	held	I2003-10,11	CTV+; needs warm temperature indexing & sPAGE

Table 2. Germplasm distributions from the National Clonal Germplasm Repository for Citrus and Dates for CY2003, CY2004, and CY2005.

	CY2003	***CY2004***	***CY2005***
Citrus	394	230	799
Dates	99	5	16
Total	493	235	815