

## Apple CGC Teleconference Minutes

March 11, 2015 11:00-1:00 EDT

The Apple CGC teleconference was hosted by CGC Chair Gayle Volk and had the following participants on the call: Jay Norelli, Gan Yuan Zhong, Thomas Chao, Bill Srmack, Ben Gutierrez, Greg Noden, Heidi Schwaniger, Kenong Xu, Ben Orcheski, Gennaro Fazio, Margarita Bateman, Gary Kinard, Diane Miller, Kate Evans, Jim McFerson, Steve VanNocker, Jim Luby, and Cameron Peace.

1. New members Greg Peck (Virginia Tech) and Carol Miles (Washington State University) were welcomed to the committee.
2. The Office of National Programs report was distributed with the agenda (see attached).
3. Gary Kinard presented the National Germplasm Resources Laboratory Report (see attached).
  - Thomas Chao's Exploration proposal for *Malus angustifolia* from the Southern US was funded for 2015.
  - Ned Garvey's retirement left a vacancy at the Plant Exchange Office. NGRL will be recruiting for a Taxonomist in anticipation of John Wiersema's expected retirement in the next few years.
  - A Benefit sharing/Access Specialist will be hired at a later date.
  - GRIN-Global is undergoing security screening prior to its release.
  - The public website is fully functional (except for receiving orders).
  - Genome database interoperability will be pursued once the release of GRIN-Global is complete.
4. Margarita Bateman presented the Quarantine Report (see attached).
  - The Pome/Prunus quarantine program is located at Building 580 in Beltsville.
  - There are currently 178 apples, 165 pears, and 34 quince in quarantine.
  - September 30 is the annual deadline for reserving slots to receive new materials through quarantine.
  - There are a total of 50 slots/year for pome fruits (apple, pear, quince) and they do not always fill up.
  - Only the owners of the materials are notified of the release. In some cases, owners request that the repository maintain the materials that are provisionally released.
  - If there might be public interest and the owners approve, the repository is notified of availability.
  - If a previously cleaned up accession (privately held) is requested, the owner may be asked by the quarantine staff if it can be released to the public sector.
5. Apple Crop Vulnerability Statement is available online.

<http://link.springer.com/article/10.1007%2Fs10722-014-0194-2>

6. Thomas Chao presented the Curator Report (see attached).
  - Given the cold weather and heavy snow this year, trees may bloom close to the same time, and flowers could be damaged if there are April frosts.
  - More than 6000 samples were distributed, with 347 going to foreign countries. Requests were for DNA, RNA, Leaves, Fruit, and Pollen.
  - An exploration trip was funded for *M. angustifolia*, which will take place in early September, 2015.
  - Another exploration will be submitted to collect additional North American *Malus* species in 2016.
  - GBS genotyping has been performed for most of the main collection and the Gala x *M. sieversii* F1 populations. SNP maps will be made available as a resource. Data analyses are underway.
  - 2 F1 populations are being phenotyped for secondary metabolites and fruit quality.
  - Since 2012, 157 *M. sieversii* and *M. orientalis* accessions have been added to the grafted collection from the seedling orchards.
  - Additional *M. sieversii* with post-harvest disease resistance will soon be added.
  - The K1 *M. sieversii* block will be taken out during the winter of 2015, so this is the last season for collecting data on those trees. The block cannot be replanted until Spring 2019, so space will be limited until that time.
  - Collection materials are being backed up using dormant bud cryopreservation.
  - There is talk of removing the other wild species orchard W3 in the future.
  - Jim McFerson requested that a map be circulated with the report. One has been attached to the minutes.
  - Thomas Chao presented an idea that perhaps some rarely requested accessions be maintained solely in LN.
  - It was recommended that a written Strategic Plan for the Apple Collection be circulated and reviewed by the Apple CGC. Gayle Volk suggested that this Strategic Plan be developed by the PGRU and circulated for comment prior to the next Apple CGC meeting (Fall 2015).
  - Gayle Volk suggested that a Cryopreservation Backup Strategy for the apple collection could be developed by Thomas Chao, Gayle Volk, and Maria Jenderek for review and comment prior to the next Apple CGC meeting. This document will include current LN survival results and a priority listing of materials to be cryopreserved in the future.
7. Discussion: Value of the Gala x *M. sieversii* crosses in the repository and whether PGRU will have the capacity to maintain these sorts of materials in the future. The general consensus was that there is value of having these materials on their own roots at the PGRU. They are highly requested. Availability of these materials is increasing the possibility of the use of *M. sieversii* materials in breeding programs in the future. Grafted duplicate collections have been made elsewhere. Perhaps future crosses will be placed into nursery or seedling blocks for genomic selection. Perhaps the needs of researchers and breeders will be considered in the development of future introgression crossing efforts.

8. Evaluation proposals are due to Gayle Volk by March 13, 2015. A subcommittee was set up to review the proposals including Kate Evans (chair), Mike Wisniewski, Jim McFerson, Gennaro Fazio, Thomas Chao, and Cameron Peace. Ranked proposals will be forwarded to National Program Staff for funding consideration.
9. Steve Van Nocker presented a progress report on his 2014 funded CGC Evaluation Proposal.
  - The duration of endodormancy is being assessed for 200 trees in the core collection using an in vitro system.
  - 10 accessions are being evaluated for the diversity of bloom time and chilling requirements.
  - When complete, new descriptors will be added to GRIN to document this information.
10. Randy Beaudry's publication on the volatile profiles of the Apple Core Collection (CGC funded project) is published in the Journal of Ag Food Chemistry.
11. Diane Miller presented a summary of the *M. sieversii* accessions from Kazakhstan and Kyrgyz Republic that are planted at the Dawes Arboretum in Ohio. These materials are available for research and evaluation.
12. Gayle Volk proposed the formation of a CGC Phenotyping Subcommittee that will make a list of evaluation priorities for the apple collection. This list could be used to rank future Evaluation Proposals and to inform the research community and repository about evaluations that would have high impact. The list could have sections devoted to different sectors, including dessert varieties, cider varieties, taxonomic representatives/species materials, etc. Jim Luby has agreed to chair this committee. Members include: Jim McFerson, Cameron Peace, Gennaro Fazio, Kate Evans, Gayle Volk, Thomas Chao, and Greg Peck. The committee will report back to the CGC for comments and feedback prior to the next CGC meeting (Fall 2015).
13. Upcoming activities:
  - The National Association of Plant Breeders will be meeting July 28-30, 2015 in Pullman, WA. There will be an emphasis on Rosaceous crops at the meeting, as well as tours of the PI Station, Central Ferry, and Prosser.
  - Cameron Peace is proposing a new SCRI project that will create a website to present/verify pedigrees of cultivars (and synonyms).
14. The next CGC meeting will be held at the Geneva Repository. The selected dates (based on a Doodle Poll and curator availability) are: October 7-8, 2015.

Key discussion points for the next meeting include:

  - Strategic Plan for the Apple Collection
  - Cryopreservation Backup Strategy
  - Phenotyping Priorities

## **PROGRESS REPORT for APPLE CGC March 11, 2015 Meeting**

**Plant Genetic Resources Unit, USDA-ARS**

**Geneva, NY 14456**

**Prepared by C. Thomas Chao, Horticulturist/Curator**

**Email: c.thomas.chao@ars.usda.gov**

**March 11, 2014**

**Apple CGC meeting**

The winter of 2014-2015 has been a challenged one weather wise so far. We had the coldest February on record. We have over 52 inches of snow accumulation so far at Geneva, NY. The combination of coldness and snow accumulation has made field work difficult. We are concerned that if there are 2-3 consecutive warm days with temperature above 70<sup>0</sup>F in the coming weeks, then all the *Malus* accessions would start to push and flower. Once the flowers are out and they could suffer damage from potential late frost in April, a repeat of 2012 season. Last year we also experienced more severe rainstorm and thunderstorm events in spring and fall season. Some rain storm was severe enough to cause erosion, standing water, tree lost, and increased disease potential.

We provided 6,008 *Malus* samples from 3/1/2014 to 2/28/2015 based on 347 requests including 25 foreign requests. The samples included 9 pollen samples, 218 fruit samples, 1,771 leaf samples, and 4,010 scion budwood. There were 61 “Botany of Desire Seeds” orders and 22 were for foreign distribution. Currently we have 76,353 “Botany of Desire Seeds” on hand. Based on the currently rate of request, 60+ requests per year and 25 seeds per order, we should have enough supply for the next 45+ years.

We received one seed accession of *M. orientalis* from Georgia in October 2014. We collected additional open pollinated seeds from seedlings of *M. sieversii* in K1 block (the “Botany of Desire Seeds”) in fall 2014. A plant exploration proposal titled “Plant exploration in Arkansas, Mississippi, and Alabama to collect *Malus angustifolia* germplasm” was funded by the Plant Exchange Office, National Germplasm Resources Laboratory. The expedition will take place in early September 2015 to collect *M. angustifolia* germplasm in three Southern U.S. States. Currently we have 59 accessions of *M. angustifolia* in our collection. Most, 56 out of 59, were collected by E. Dickson at 18 sites from 6 states (GA, FL, NC, NJ, SC, and VA) in 1987. We do not have any sample from other Southern States where *M. angustifolia* is naturally distributed. A gap analysis by USDA National Center for Genetic Resources Preservation (NCGRP) also identified the needs for collecting more *M. angustifolia* from other Southern States and two other wild *Malus* species (*M. coronaria* and *M. ioensis*). Another plant exploration proposal will be submitted to Plant Exchange Office for additional exploration of North American wild *Malus* germplasm in 2016.

We completed the GBS genotyping of all 7 F1 populations of ‘Gala’ x *M. sieversii* in G1 block. We will provide consensus SNP genetic maps for all 7 F1s as resources for the research community. We continue collecting fruit and leaf samples of the core collection and two F1 populations for secondary metabolites and fruit quality characterization. We finished the second year recording of bud break, full bloom and end of bloom for all permanent *Malus* collection in 2014. The third year phenology data will be collected in spring 2015. We will continue digital

imaging effort of *Malus* accessions in 2015. The start of the new germplasm database system, GRIN-Global, is postponed. Clonal personnel participated in online training courses of the new database system in December 2014 and January 2015.

We re-shipped 11 *Malus* accessions and 8 *Prunus* accessions at two different timing in early 2015 to USDA-ARS Plant and Animal Genetic Resources Preservation Unit (PAGRPU) at Fort Collins, CO. for testing cryo-preservation procedure. Currently we are shipping 30 *Malus* accessions each year to PAGRPU for cryo-backup storage. We have 216 *Malus* accessions in the collections are ready for cryo-backup storage. They were planted in the field between 2003 and 2012. According to PAGRPU, there are also over 200 *Malus* accessions in cryo-storage with very low number of estimated viable dormant bud and they should be re-processed for cryo-backup storage. Current estimation is that it will take at least 14 years to process these *Malus* accessions for cryo-storage.

The *Malus sieversii* seedling block (K1 block) is scheduled to be removed by end of 2015 as reported in the past. Currently we have about 50 planting space left in the permanent *Malus* collection block (M7 and E7 blocks) for new *Malus* accession. This limited available planting space would be used up in the next two years. If we remove the K1 block and relocation of the wild *Vitis* species seedling block (W2 block, adjacent to the K1 block), we will need to wait till spring 2019 before we could plant new *Malus* accession in the K1 site due to the concern of apple replant disease. We will be extremely tight in planting space for new *Malus* accession in the next few years. We will propagate additional *M. sieversii* seedlings from K1 block in 2015 if needed and collect additional “Botany of Desire Seeds” from K1 block in fall 2015.

We hosted 11 college/University classes and student groups at the clonal collection in 2014 with over 190 students, professors and stakeholders. We also hosted individual visits by other scientists, breeders, germplasm researchers, growers, stakeholders, and ARS National Program leaders. I answered questions and provided access of the *Malus* collection to author Rowan Jacobsen for the synthesis of the book titled “Apples of uncommon characters, 123 heirlooms, modern classics, and little-known wonders”, pp.311, that was published by Bloomsbury Press, New York, NY. in 2014. I gave an interview about the clonal collection to “Garden Journey” by Terry Ettinger, Time Warner Cable Television News of Central New York in December 2014.

We continue cooperating and supporting several research projects using the *Malus* collections: (1) “GBS of *Malus* collection” jointly conducted by S. Myles, Dalhousie University, G. Volk and C. Richards, NCGRP, and PGRU; (2) “Development of biological system for controlling fruit decay” by M. Wisniewski and W. Janisiewicz, USDA-ARS AFRS, Kearneysville WV; (3) “Breeding apple rootstocks tolerant to abiotic stresses and resistant to pests and diseases” by G. Fazio, PGRU; (4) “Methods for rapid identification and functional analysis of fungi causing postharvest decay of pome fruit” by W. Jurick and J. Yu, Food Quality Laboratory, USDA-ARS, Beltsville, MD.; (5) “Improving stress and disease resistance in tree fruit crops” by M. Wisniewski, T. Artlip, C. Bassett, and J. Norelli, USDA-ARS AFRS Kearneysville, WV; (6) “Genetic characterization of fruit quality traits in the USDA *Malus* germplasm collection” jointly by S. Brown, Cornell University and PGRU; (7) “Evaluation of cryptic flowering in the USDA *Malus* germplasm collection” by S. van Nocker, Michigan State University and P. Hirst, Purdue University; (8) “Genetic and genomics of fruit quality traits and

tree architecture traits of *Malus*” by K. Xu, Cornell University; (9) “Deep sequencing of *M. sieversii* genome” by Y. Mayshar, J. Davis, Harvard University, G. Volk, NCGRP, and others; (10) “Deep sequencing of *Malus* species genomes by L. Cheng, Cornell University and Z. Fei, Boyce Thompson Institute for Plant Research; (11) “MicroRNA related to resistance / susceptibility of *Malus* against apple stem grooving virus” by Z. Liu, USDA-ARS AFRRS Kearneysville, WV; and (12) “Evaluation of *Malus* collection against codling moth” by S. Whithead and K. Poveda, Cornell University.

**Publication:**

PGRU *Malus* related publications:

- Fazio, G., C.T. Chao, P.L. Forsline, C. Richards, and G. Volk. 2014. Tree and root architecture of *Malus sieversii* seedlings for rootstock breeding. Proc. Xth IS on Integrating Canopy, Rootstock and Environmental Physiology in Orchard Systems. Acta Hort. 1058:585-594.
- Volk G.M., C.T. Chao, J. Norelli, S.K. Brown, G. Fazio, C. Peace, J. McFerson, G.-Y. Zhong, and P. Bretting. 2014. The vulnerability of U.S. apple genetic resources. Genet. Res. Crop Evol. DOI 10.1007/s10722-014-0194-2.
- Volk, G.M., A.D. Henk, A. Baldo, G. Fazio, C.T. Chao, and C.M. Richards. Chloroplast heterogeneity and historical admixture within the genus *Malus*. Amer. J. Botany (Submitted on 10-1-2014; accepted for publication with revision on November 26, 2014).

PGRU *Malus* related Abstracts:

- Norelli, J.L., K.M. Evans, M.E. Wisniewski, C.T. Chao, C. Hampson, and A. Iezzoni. 2014. Characterization of resistance to fire blight (*Erwinia amylovora*) and blue mold (*Penicillium expansum*) in exotic and domesticated *Malus* (apple) germplasm. 7<sup>th</sup> International Rosaceae Genomic Conference. June 24-28, 2014. Seattle, WA.
- Volk, G.M., C.T. Chao, and K. Hummer. 2014. A global conservation strategy for apple. 7<sup>th</sup> International Rosaceae Genomic Conference. June 24-28, 2014. Seattle, WA.
- Volk G., C. Richards, A. Henk, A. Baldo, G. Fazio, and C.T. Chao. 2014. Application of genetic and spatial analyses to identify collection priorities for wild *Malus* species. 7<sup>th</sup> International Rosaceae Genomic Conference. June 24-28, 2014. Seattle, WA.

Geneva *Malus* germplasm used or mentioned in the study/publication:

- Fields, H. 2014. Sculpting the apples of science. Proc. Nat. Acad. Sci. 111(22):7883.

**2015 USDA-APHIS Quarantine Report**  
**Apple CGC**  
**Beltsville, MD**  
**March 11, 2015**

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Pome/*Prunus* Fruit Trees Quarantine Programs  
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**Introduction**

The Plant Germplasm Quarantine Program (PGQP) imports fruit introductions, propagates them, tests them for pathogens, and releases them to importers and repositories. The APHIS quarantine program for Pomes (Apple-Pear-Quince) and *Prunus* accessions and seedlings is a consistently robust quarantine program which has improved during the last eight years in the number of accessions tested, sent to therapy, and release of material. In addition it has established tissue culture therapy for Pomes and *Prunus* which expedites the process of release of the materials in quarantine. The total amount of final releases of Pomes and *Prunus* since 2007 is 1,913. We currently have active and ongoing collaboration with the Pomes and *Prunus* Repositories, Crop Germplasm Committees, with scientists, commercial nurseries, and private growers.

**Accessions being tested**

As of May 2015, Robert Jones, Pomes Crop specialist for Pomes has under his care the following pome accessions: 178 Apples, 165 Pears, 34 Quinces. In 2015 we received apple accessions from Italy and pear accessions from The United Kingdom. Tom Kim, *Prunus* Horticulturist has currently under his care *Prunus* accessions which include sweet and tart cherries, apricots, nectarines, peaches, plums and almonds as well as ornamental *Prunus*. In 2015 we received new *Prunus* accessions from Kyrgyzstan (tart cherries), and Spain (almonds, peaches, apricots, cherries). Our tissue culture expert, Richard Slocum continues to establish accessions in tissue culture in order to put them through therapy. These accessions are undergoing therapy and testing at different levels within the program.

**Pathogen interceptions**

Our program intercepts every year a series of pathogens of quarantine significance in fruit trees of Pomes and *Prunus*. These mentioned below were discovered last year as part of the routine testing for pathogens. Testing was done using indicators, molecular tests and immunological tests. The trees that test positive are sent to thermotherapy through in vitro culture. Enclosed below are some of the pathogens intercepted in incoming material:

**Pomes program:** Viroids: *Apple fruit crinckle viroid*, *Pear blister canker viroid*;  
Viruses: *Apple stem pitting virus*, *Apple stem grooving virus*, *Apple chlorotic leafspot virus*.

**Prunus program** Viruses: *Cherry necrotic rusty mottle*, *Cherry virus A*, *Plum bark necrosis stem pitting associated virus*, *Asian prunus virus*, *Little cherry virus 1*, *Little cherry virus 2*, *Prunus necrotic ringspot virus*, *Prune dwarf virus*; Viroids: *Peach latent mosaic viroid*; *Phytoplasma*

**Releases 2015**

<i>Crop Type</i>	<i>Final Release</i>	<i>Provisional Release</i>	<b>Total Released 2015</b>
<b>Pomes accessions</b> by B. Jones	<i>Malus</i> - 10 <i>Pyrus</i> -2 <i>Cydonia</i> -0 Total:	<i>Malus</i> -29 <i>Pyrus</i> -19 <i>Cydonia</i> -0 Total:	<i>Malus</i> -39 <i>Pyrus</i> -20 <i>Cydonia</i> -0 Total:
<b>Prunus accessions</b> by Tom C. Kim	<i>Prunus</i> -1	<i>Prunus</i> -22	<i>Prunus</i> -23
<b>Prunus- *seedlings</b> *by J.Foster/D. Johnson	204	0	204
<b>Total</b>	<b>Final</b>	<b>Provisional</b>	<b>Total 286</b>

**Release Summary: 2007-2015**

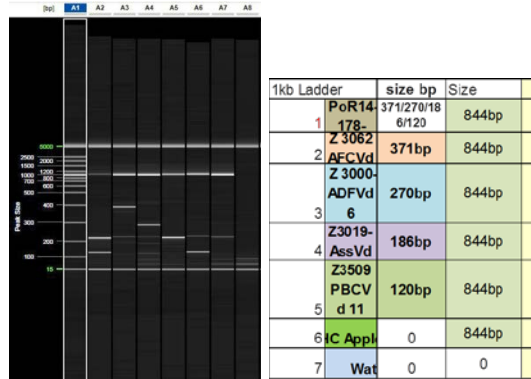
<b>Crop</b>	<b>FY2007</b>	<b>FY 2008</b>	<b>FY 2009</b>	<b>FY 2010</b>	<b>FY 2011</b>	<b>FY 2012</b>	<b>FY 2013</b>	<b>FY 2014</b>	<b>FY2015</b>
Pome Fruits	2	0	23	57	48	100	72	32	59
<i>Prunus</i> clones	6	17	33	16	50	41	35	20	23
<i>Prunus</i> *seedlings	31	70	138	196	111	107	332	247	204
Total per year	<b>39</b>	<b>87</b>	<b>194</b>	<b>269</b>	<b>209</b>	<b>248</b>	<b>439</b>	<b>351</b>	<b>286</b>



**Pathogen detection procedure to be validated by comparing and contrasting with current existing tests:**

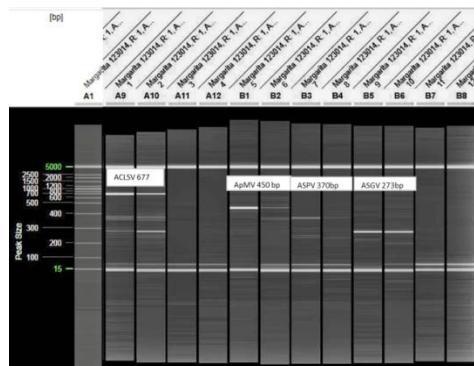
1. One step multiplex for the detection of four pomes viroids: *Apple fruit crinkle viroid*, *Apple dimple fruit viroid*, *Apple scar skin viroid*, *Pear blister canker viroid*.(with internal controls)

*One-step multiplex RT-PCR for simultaneous detection of four pome tree viroids. Liming Lin & Ruhui Li & Ray Mock & Gary Kinard. Eur J Plant Pathol (2012) 133:765–772. DOI 10.1007/s10658-012-9956-x*



2. One-Step Multiplex RT-PCR test for the simultaneous detection of viruses: *Apple stem pitting virus*, *Apple stem grooving virus*, *Apple chlorotic leafspot virus* and *Apple mosaic virus*.(with internal controls)

*Simultaneous detection and identification of four pome fruit viruses by one-tube pentaplex RT-PCR. Mohamed Hassan a,b,\*, Arben Myrta c, Jaroslav Polak Research Institute of Crop Production, Department of Virology, Drnovska 507, 161 06 Prague 6, Czech Republic Czech University of Agriculture, Department of Plant Protection, 165 21 Prague 6, Czech Republic, Istituto Agronomico Mediterraneo, Via Ceglie 9, 70010 Valenzano, Bari, Italy Journal of Virological Methods 133 (2006) 124–129*



**Additional Announcement:**

The 2015 Annual WERA-20 Meeting will be held in Beltsville, MD July 6-1, 2015, at the ARS Bldg 5. On the first day, Monday July 6, 2015 there will be presentations related to Next Generation Sequencing(NGS) during the second day, Tuesday, July 7, 2015 we will have a panel of APHIS policymakers and scientists holding a joint discussion on the issue. The next two days: Wednesday July 8 and Thursday July 9 will include the customary State and University, Government Progress Reports related to recent advances in relation fruit tree and small fruits viruses or new pathogens. On Wednesday night, we will have a Gala Dinner at the US National Arboretum. The last day will include a tour of the facilities at Bldg 580, including facilities of CPHST as well as and the Plant Germplasm Quarantine Program. For information you may contact Dr. M.L. Bateman, Chair or Dr. Gary Kinard, Co- Chair of the 2015 WERA-20 Meeting. Please share this information with those that may be interested.

