

Apple CGC Meeting/Teleconference
Sept. 21, 2016 1-4 EDT

Attendees: Gayle Volk, Margarita Bateman, Thomas Chao, Susan Brown, Diane Miller, Gennaro Fazio, Cameron Peace, Peter Bretting, Phil Baugher, Bill Srmack, Gary Kinard, Jim McFerson, Greg Peck, Chris Richards, Ruhui Li (minutes provided by Gayle Volk)

Report: Office of National Programs Report (Bretting)

Collections are growing and budgets are not. The NPGS management priorities are listed in descending order: Maintenance, Regeneration, Documentation & Data management, Acquisition, Distribution, Characterization, Evaluation, Enhancement. Research to support these priorities is key because it improves all the listed processes. Key challenges that stretch the NPGS's resources: 1) Managing and expanding the NPGS operational capacity and infrastructure to meet the increased demand for germplasm and associated information; 2) Fulfilling the demand for additional germplasm characterizations/evaluations; 3) Acquiring and conserving germplasm of crop wild relatives; 4) BMPs and procedures for managing accessions (and breeding stocks) with GE traits and the occurrence of adventitious presence (AP). Crop vulnerability statements need to be updated.

Report: National Germplasm Resources Lab/GRIN-Global Report (Kinard)

See attached report. Ruhui Li, Plant Pathologist at the NGRL, has joined the Apple CGC.

Report: APHIS (Bateman)

See attached report. The quarantine program follows the international guidelines. In general, about 70% of the apple accession that enters the quarantine process can be successfully cleaned up. About 30 accessions were accepted into the pome fruit quarantine program this year. Very few accessions enter the quarantine program and do not have some sort of disease; these are usually grower certified stocks. The quarantine program is in the process of switching to sequencing based methods for pathogen identification. These methods will focus on identifying disease-causing pathogens.

Membership (Volk). It was proposed that the official Apple CGC membership list be limited to people who have participated on the committee in some form (attending meetings in person or by teleconference, serving on a committee, participating in the vulnerability statement update) sometime in the past 3 years. The mailing list used for information distribution will continue to include anyone interested in receiving information. Please contact Gayle if you would like to be removed from the email list.

Report: Apple Collection, Current Status (Chao)

See attached report. Traps were placed in the apple collection to monitor black stem borers weekly in 2016. The peak of the trapping was in early June, and populations decreased after they were sprayed with Lorsban. The borers appear to be coming from an adjacent unmanaged forest block.

K1 inventory: There will be space for 391 accessions in the K1 block. There are currently 104 accessions in the 2015 and 2016 nursery, 30 *M. sieversii* accessions are anticipated from Diane Miller and 20 *M. sieversii* accessions are anticipated from Elene Garcia.

Discussions are beginning with respect to how to select materials from the W3 orchard for repropagation into the main collection. In addition, crosses may be made between 20 wild species and *Malus domestica* to develop additional mapping and selection blocks. Due to the limited orchard space, the seedling crosses may be maintained in the greenhouse.

Cryostorage and Back-up (Jenderek/Volk/Chao)

A table was circulated (see attached) that summarizes the extent of apple collection back-up at NLGRP. It was emphasized that most of the cryopreserved apple accessions at NLGRP were processed in the 1990s and a total of 60 dormant buds were processed in 5 cryotubes. One was thawed as a viability control, and four tubes of 12 buds each were left in storage. This means that there were originally four repropagation events possible for most of the cryopreserved accessions. In January 2016, 69 high-priority accessions (according to the cryo-assessment for apple that was performed in 2015) were sent to NLGRP for cryo back-up. The viability results for those accessions are not yet available. Due to a large Citrus cryo back-up occurring between September 2016 and February 2017, it is doubtful that any apple accessions will be cryopreserved this upcoming winter.

Updates on ongoing research collaborations involving NPGS Apple Collection

- **Rootstock Breeding Program (Fazio):** 8-10 million Geneva-bred rootstock pieces were distributed by the industry last year. New rootstocks are being bred that incorporate wild species materials. Geneva 35 (800,000 to 1,500,000 pieces) appears to be susceptible when infected with both apple chlorotic leaf and apple stem pitting viruses. A full sib (Geneva 14) may also be susceptible to apple stem grooving virus. Field observations and pathological assessments are underway.
- **Cornell breeding program (Brown):** Markers have been identified that are linked to the pale green lethal mutant (where 25% of progeny die). These plants have the inability to make Vitamin K. Ben Guitterez is measuring phloridizin and other compounds in *domestica* and wild species of apples. Interspecific hybrids have been developed. The Cornell Experiment Station, Apple Pathologist position has been filled.
- **RosBreed 2 (Peace):** Marker assisted introgression is underway in Kearneysville whereby wild species materials are being used to introgress desirable alleles for resistance to apple scab, fire blight, and blue mold. The use of marker technologies and rapid-flowering trees has facilitated this process.
- **Hard cider varieties (Peck):** Important cider varieties are being released from quarantine. Twenty-one English cider varieties nicknamed "The girls" were brought into the quarantine program this year. Efforts are underway to screen the *M. orientalis* and *M. sieversii* collections for accessions with high tannin and acidity levels. Twenty five Spanish cider cultivars were imported in the US over a decade ago by Ian Merwin. Nine of these cultivars are now available at the PGRU; the rest are in still under quarantine restrictions. Greg Peck had the nine available cultivars budded this summer so that he can start testing their horticultural and cider quality characteristics. Additional cultivars will be added over time.

Update on Global Conservation Strategy for Apple (Volk): A survey was distributed to apple collection curators throughout the world a couple years ago and responses were received from 41 collections. The survey results are being summarized as part of the global strategy development process. It is likely that the proposed global apple collection will be a dispersed collection making use of a network of existing apple collections. Consolidated databases and molecular

genotyping programs will hopefully help link the information available for the international collections.

Comments:

It was requested that materials be distributed earlier for future CGC meetings so that attendees have time to review the information ahead of time.

It was also requested that shorter Apple CGC meetings be held more frequently, rather than having a longer meeting once a year. Members would also like to see an assessment of the needs of the NPGS apple collection including anticipated maintenance costs and collection growth trajectories. There's a concern about the lack of replicate trees in the collection and that many trees are being replaced using cryopreserved back-ups each year, which could easily deplete the cryo-backup collection.

The next Apple CGC meeting will be held by teleconference in a few months. This meeting will incorporate the comments above and discuss strategic plans for the upcoming five year plan that will be written in early 2017.

REPORT for APPLE CGC September 21, 2016 Teleconference Meeting

Plant Genetic Resources Unit, USDA-ARS

Geneva, NY 14456

Prepared by C. Thomas Chao, Horticulturist/Curator

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

Holdings

The *Malus* core collection is located in the B9 block. The permanent collection is located in the M7 and E7 blocks. The seedlings of wild *Malus* species from several countries are located in the W3 block. The 7 F1 populations from 'Gala' x 7 *M. sieversii* seedlings plus seedlings of wild *M. orientalis* are located in the G1 block. The *M. sieversii* seedling block (K1) was removed in December 2015. The field will be rested and planted with cover crops for minimum 3 years before new planting of *Malus* accessions.

We maintained 5,910 *Malus* accessions, 1,392 *Vitis* accessions, and 130 *Prunus* accessions at PGRU. Working with Dr. A. Agnello, Entomology, Cornell University, we began weekly monitoring the apple black stem borer (*Xylosandrus germanus*) since April 15, 2016 and to be better managing this insect pest. The trapping data showed that the peak of the trapping occurred on June 1, 2016 with the highest number of black stem borers trapped on the outside traps (traps located at the fence)(13 & 20 black stem borers found) than traps located inside the collection (traps located 10 trees away from the edge of the block) (4 & 5 black stem borers found)(Table 1). Since the peak trapping on June 1, 2016, there was 0-1 black stem borer found weekly in the inside traps and 0-4 black stem borers found weekly in the outside traps. The trapping data showed that the black stem borers are moving from adjacent forest block, near the southeastern corner of the collection, to the collection. The neighboring forest block is not managed for black stem borer, therefore the issue will be with the collection for years to come. The best approaches for the management are best timing of spraying of pesticide based on insect monitoring and clean orchard management. Currently only one application of Lorsban is allowed per season. We might consider other pesticides if needed.

Recent Acquisitions

We received 14 wild *Malus ioensis* seed accessions from J. Carstens, USDA-ARS North Central Regional Plant Introduction Station in October 2015. Chao, clonal curator, carried out an exploration from September 5-20, 2015 in Arkansas, Mississippi, Louisiana, and Alabama and collected 37 seed accessions of *M. angustifolia* and two seed accessions of Muscadine grape (*Vitis rotundifolia*). All seeds were extracted, accessioned, and stored at -20°C freezer. A total of 7,006 seeds of *M. angustifolia* were extracted. The numbers of seed range from 2 to 1,362 per tree, with an average seed number of 189 per tree. In January 2016, we received and propagated dormant budwood of 28 crab apples belonging to different *Malus* species and species hybrids from the National Arboretum. These crab apples were removed later at the National Arboretum. We received one accession of *M. trilobata* in February 2016 from the Arnold Arboretum, Harvard University and one seed accession of *M. trilobata* in April 2016 from Turkey. We received one seed accession of *M. coronaria* from D. Miller, Ohio State University in February, 2016. We received 'Campfield' *M. hybrid* from B. O'Gorman, East Sandwich, MA also in February, 2016. We propagated a possible sport of 'Muz-Alma' (PI 30326, collected by Frank Meyer from Chinese Turkestan in 1910) in March 2016. We received one seed accession of *M. sylvestris* from Albania through Plant Exchange Office in August 2016. We collected over 33,000 additional open

pollinated seeds from the wild *M. sieversii* seedling block (K1) in fall 2015. Overall, over 110,000 OP seeds of *M. sieversii* seedlings were collected from 2002-2015. We sent 69 *Malus* accessions on January 26, 2016 to NCGRP, Fort Collins, CO for cyro backup storage. We also shipped a large quantity of budwood of 8 tart cherry accessions and 11 *Malus* accessions to NCGRP on January 20, 2016 for a cryo-protocol improvement experiment. We should receive seed accessions of *M. angustifolia* from Missouri in the fall 2016. We will also receive dormant budwood of crab apples from the Arie den Boer Arboretum in Des Moines, IA in winter 2016-2017. The Arie den Boer collection is being revitalized. We are offering advice on the revitalization process.

I carried out a second plant exploration of *M. angustifolia* (Southern Crab Apple) in Arkansas, Mississippi, and Louisiana from August 22-28, 2016, supported by the Plant Exchange Office, National Germplasm Resources Laboratory, USDA-ARS. I collected 37 budwood and 17 fruit samples from 38 trees in AR, MS, and LA. These 37 budwood were double budded onto two G210 rootstocks (4 buds total). The seeds from 17 fruit samples are being extracted and the seeds will be stored at -20C freezer. One proposal titled “Plant Exploration in Pennsylvania to Collect *Malus coronaria* Germplasm” and one titled “Plant Exploration in Taiwan to Collect Wild *Malus*, *Pyrus*, and *Juglans* Germplasm” were submitted to the Plant Exchange Office in July 2016. G. Volk submitted an exploration proposal for collection of *M. sylvestris* in Europe. If the proposals were funded, all three exploration would take place in fall 2017.

Personnel, Fiscal, and Operational Resources

The reduction in field personnel since 2015 has not been resolved yet. We hired a temporal full time field assistant from January to May 2016. We are in the process of hiring a part time/full time term position for field assistance. The new personnel may start in October 2016. Pesticide spraying of the *Malus* and *Prunus* collection is carrying out by the Field Research Unit (FRU), Cornell’s New York State Agricultural Experiment Station. Some mowing and pruning, burning of plant debris, and special projects (such as removal of K1 block) were also carried out by the FRU. We carry out the pesticide spraying for the *Vitis* collection, and herbicide and sucker spraying of all collection. The clonal collection and the entire northwestern upper New York State was under a severe drought declaration in early summer in 2016. We are considering installing irrigation system in the *Prunus* collection in 2017 and possible also in portion of the *Malus* collection. Currently there is no irrigation system in any of the permanent collection. We do setting up irrigation line for the nursery when needed.

Characterization

PGRU supplied 67 *Malus* accessions of 13 species or species hybrids including 15 *M. sieversii* accessions and 10 *M. sylvestris* accession in a cooperating research with Cornell University and scientists from China for a deep sequencing effort of 97 total *Malus* accessions. The genome sequencing effort also include 10 *Malus* species from China and 14 *M. sieversii* accessions from Xinjiang, China. This is a first genome sequence comparison of *M. sieversii* from both the western (Central Asia) and eastern (China) of Tian Shan Mountain range. The results indicated that *M. sieversii* in Xianjiang, China is a more ‘ancient’ isolated ecotype and has not directly contributed to the modern apple domestication (Duan et al., in submission). Identification of QTL controlling fruit size also suggests that two major events for apple fruit size during the domestication process, one before the domestication and one during the domestication. These genome sequence information could offer opportunities for mining of new alleles controlling traits of interest. It could also help in the G1 mapping effort of the *M. sieversii* genome.

We are evaluating additional traits in the G1 F1 populations. Phenology traits were recorded in spring 2016. Secondary metabolites of the peel and flesh of two F1s (4592 and 4593) are being collected and additional RNA seq data will also be collected. Genetic maps of 4590, 4591, and 4593 based on GBS markers and RosBREED 10K SNP chips are completed. The integrated maps of four other F1s are in the work. Additional morphological traits of all 7 F1s will be scored this winter.

Distributions and supporting research

We distributed 5,618 *Malus* samples based on 336 orders in 2015. The total samples distributed for clonal was 7,355 based on 444 requests in 2015. We have seen an overall increase in the number of orders in the past year. Four hundred and forty four requests was the largest ever for the clonal collection.

Hundreds of foliage and floral photos from 53 wild *Malus* species and hybrid species provided by PGRU became available since August 2016 and they are searchable in the Genome Database for Rosaceae (GDR) at <https://www.rosaceae.org/search/germplasm/image>. One could type in the genus name then select the species to view all available photos. G. Volk provided the linkage with the GDR since 2014 to make this possible.

We continue cooperating and supporting many research projects using the *Malus* collections: (1) “Detection of new viruses of *Malus*, by H. Li, Molecular Plant Pathology Laboratory, USDA-ARS, Beltsville, MD.; (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 and B. Gutierrez, 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 AFRS Kearneysville, WV; (12) “Deeping sequencing, genome duplication and polyploidization of *Malus ioensis*”, by J. Higgins, University of Leicester, England, S. Mathews, CSIRO, Australia, J. DaCosta, Harvard University, and L. Yant, John Innes Center, England; (13) “Apple variety and heirloom variety identification”, by B. Gross, University of Minnesota Duluth; (14) “Evaluation of Kyrgyz Republic apple germplasm: Phenotypic evaluation at Dawes Arboretum (Ohio); molecular analyses of elites for fruit quality and disease-resistance by RosBREED; novel selections for the NPGS, Geneva, NY” by D. Miller, Ohio State University; (15) “Evaluation of 1995 Kazakhstan *Malus sieversii* seedling populations as mature trees in a central southern temperate climate”, by E. Garcia and C. Rom, University of Arkansas; (16) “Evaluation of *Malus* species and accessions for cider potential” by Will McClatchey, Thousand Arbor Refuge; (17) “*Malus* collection and hard cider production potential” by Empire Cider Company; (18) “Fruit quality evaluation of the *Malus* collection for cider making quality”

by N. Wojeyna, G. Peck, and C. Gerling, Cornell University. All research requests require extensive discussion about the research scope and appropriate species and/or accessions before distribution.

Future K1 planting

The K1 block (wild *M. sieversii* seedling block) was removed in December 2015. The space created would allow planting of 391 new accessions in the future. Currently in the 2015 and 2016 nursery, we have 104 new accessions. These 104 new accessions include 28 crab apples from the National Arboretum, 33 accessions of wild *M. angustifolia*, new cider apples from Northern Spain, and other materials from other sources. In the next three years, we could receive additional materials from APHIS Quarantine Center including more Spanish cider apples and English cider apples; wild *M. coronaria* from Pennsylvania and Ohio; crab apples from Arie den Boer Arboretum; and selection from G1 and W3 blocks.

W3 block evaluation

W3 block is a block of wild *Malus* seedling block includes *M. bhutanica*, *M. hupehensis*, *M. kansuensis*, *M. orientalis*, *M. prattii*, *M. sieboldii*, *M. sieversii*, *M. sylvestris*, *M. toringoides*, *M. transitoria*, and *M. zahaojiaoensis*. They were planted in 2002. SSR markers were used to study the *M. orientalis* and *M. hupehensis* in W3. GBS markers were used to study the *M. hupehensis* in W3 also. Genetic marker should be apply to all other wild *Malus* species seedlings and identify individuals that could represent the maximum genetic diversity and propagate them into the permanent collection. General fruit characterization of the seedlings should be carry out and identify those with larger fruit size and unique fruit quality. Some of these wild *Malus* seedlings have potential to be used as mixture in hard cider production. Fruit samples of limited number of *M. orientalis* seedlings are being collected and their fruit quality from a hard cider production point of view will be evaluated. Additional fruit quality will be carry out in 2017 and beyond.

Table 1. Number of black stem borer trapped at the *Malus* collection for 2016 on the weekly basis.

Trap	4/15	4/27	5/3	5/11	5/16	5/25	6/1	6/8	6/15	6/22	6/29	7/5	7/12	7/19	7/27	8/2	8/8	8/17	8/24	9/1	9/8
Outside 1	set	0	2	1	1	4	20	1	0	0	0	0	3	1	3	2	spray	1	3	4	0
Outside 2	set	0	0	1	1	4	13	2	0	1	0	1	0	1	1	0	spray	1	0	0	2
Inside 1	set	0	0	0	2	0	5	0	0	0	0	0	0	0	1	1	spray	0	1	1	0
Inside 2	set	0	0	0	1	3	4	2	0	0	1	0	0	1	0	0	spray	0	0	0	0

Publication since October 2015

- Janisiewicz, W.J., B. Nichols, G. Bauchan, C.T. Chao, and W.M. Jurick. 2016. Wound responses of wild apples suggest multiple resistance mechanism against blue mold. *Postharvest Biology and Technology* 171:132-140.
- Migicovsky Z., K.M. Gardner, D. Money, J. Sawler, J.S. Bloom, P. Moffett, C.T. Chao, H. Schwaninger, G. Fazio, G.-Y. Zhong, and S. Myles. 2016. Genome to phenome mapping in apple using historical data. *Plant Genome* 9(2) DOI: 10.3835/plantgenome2015.11.0113.
- Volk, G.M., M.M. Jenderek, and C.T. Chao. 2016. Prioritization of *Malus* accessions for collection cryopreservation at the USDA-ARS national Center for Genetic Resources Preservation. *Acta Hort.* (In press).

Manuscript in submission

- Duan N., Y. Bai, H. Sun, N. Wang, C. Jiao, N. Legall, T. He, K. Wang, S. Jiang, H. Xu, Z. Zhang, Z. Mao, Y. Jiang, S. Wu, S. Feng, X. Chen, J. Liu, D. Wang, D. Liu, Y. Wang, C. Yin, W. Zuo, C. Liu, Y. Xu, K. Xu, C.T. Chao, G.-Y. Zhong, L. Cheng, Z. Fei, and X. Chen. 2016. Genomic analyses provide new insights into apple evolution, domestication and genetic diversity. In submission to *Nature Genetics* (44 pages of text and figures plus 997 pages of 15 supplementary tables).

Meeting abstracts

- Peck, G., M. Bateman, T. Chao, C. Miles, and I. Merwin. 2016. Importing European cider cultivars into the U.S. Cider Conference, February 2-6, 2016. Portland, OR. <http://www.ciderassociation.org/resources/Documents/Importing%20European%20Cider%20Cultivars%20into%20the%20US.pdf>
- Chao, C.T. and G. Peck. 2016. *Malus* selections for potential use in cider production. Cornell Fruit Field Day 2016. July 20, 2016. Geneva, NY (Abstract for grower meeting bulletin).
- Gutierrez, B., S.K. Brown, G.-Y. Zhong, and C.T. Chao. Genetic diversity of dihydrochalcone content in *Malus* germplasm. 113th American Society for Horticultural Science Annual Meeting. August 8-11, 2016. Atlanta, GA.
- Chao, C.T. 2016. *Malus angustifolia* (Southern Crab Apple) exploration in Arkansas, Mississippi, Louisiana, and Alabama. 113th American Society for Horticultural Science Annual Meeting. August 8-11, 2016. Atlanta, GA (Abstract #24185).
- Chao, C.T. and G.-Y. Zhong. 2016. Germplasm Collection of *Malus sieversii* from Central Asia is well-preserved in the USDA-ARS National Plant Germplasm System. 113th American Society for Horticultural Science Annual Meeting. August 8-11, 2016. Atlanta, GA (Abstract #24485).

Report

- Chao, C.T. 2016. Report of “Plant Exploration in Arkansas, Mississippi, and Alabama to collect *Malus angustifolia* Germplasm”, a report to Plant Exchange Office, USDA-ARS National Germplasm Resources Laboratory. pp.31.

Outreach Activities since October 2015

- Guided tour of the Apple collection, Dr. F. Liu, Y. Cao, and Ms. Y. Gao, National Repository of Apple Germplasm Resources, Research Institute of Pomology, Chinese Academy of Agricultural Sciences, Geneva, NY., October 9-11, 2015.

Guided tour of the Apple collection, Great Lake Fruit Growers Meeting, Geneva, NY., November 10, 2015 (57 participants).

News phone interview with Chris Baraniuk, British Broadcasting Company Future, March 22, 2016. <http://www.bbc.com/future/story/20160523-kazakhstans-treasure-trove-of-wildly-flavoured-apples?ocid=ww.social.link.email>

Guided tour of the *Malus* collection, Drs. M.V. Kvitschal & M.C. Hawerth, EPAGRI (Empresa de Pesquisa Agropecuária e Extensão Rural de Santa Catarina), Dr. F. Hawerth, EMBRAPA (Brazilian Ag. Research Corporation), Brazil, and Dr. P. Franchescatto, Cornell University, Geneva, NY., April 18, 2016.

CIDERCRAFT Magazine interview with Jeff Book, June 7, 2016. Article appears in September 2016 and it is available at: <http://digital.cidercraftmag.com/Vol62016#&pageSet=36>

Guided tour of the *Malus* collection and interview with Dave Weinstock, Good Fruit Grower, Geneva, NY., May 20, 2016; photographer TJ Mullinax, June 29, 2016.

Guided tour of the *Malus* collection, participants from “Cider & Perry Production – Foundation” class, Cornell University Cooperative Extension, Geneva, NY., May 20, 2016 (6 participants).

Guided tour of the *Malus* collection, Society for Horticulture Graduate Students (SoHo), Cornell University, Geneva, NY., May 25, 2016 (5 students).

Guided tour of the *Malus* collection, participants from “Cider & Perry Production – Building Expertise” class, Cornell University Cooperative Extension, Geneva, NY., May 27, 2016 (6 participants).

Guided tour of the clonal collection, participants from the Atlantic Seed Association 64 Annual Convention, Geneva, NY., July 14, 2016 (30 participants).

Guided tour of the *Malus* collection, Absolventenverein Landwirtschaftlicher Schulen from Terlan, Italy, Geneva, NY., July 18, 2016 (45 growers).

Presentation “*Malus* selections for potential use in cider production”, participation, and hosting one stop of the Cornell University Fruit Field Day 2016, Geneva, NY., July 20, 2016 (500+ growers, students, and researchers registered for the field day, approximately over 200 stakeholders at the clonal collection stop).

http://events.cornell.edu/event/cornell_fruit_field_day

Tour of the *Malus* collection, author/reporter Brian Barth, Geneva, NY., August 29, 2016.

Open house of the clonal collection, Geneva, NY., September 17, 2016 (50 stakeholders).

Tour of the *Malus* collection, Dr. Daniel E. Webber and Plant Science Club, New York State University Cobleskill, Geneva, NY., September 17, 2016 (14 members).

Tour of the clonal collection, Plant Breeding 4060 “Methods of Plant Breeding Laboratory” class, Professor Mark E. Sorrells, Cornell University, plus Hubert E. Humphrey Fellows and Cornell Alliance for Science Global Leadership Fellows, Geneva, NY., September 17, 2016 (44 professor, postdocs, students, and fellows total).

Dr. Margarita Licha Bateman
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2016 USDA-APHIS QUARANTINE REPORT

**Bldg 580
Beltsville, MD**

INTRODUCTION

The Plant Germplasm Quarantine Program (PGQP) imports fruit introductions, propagates them, tests them for pathogens, and releases them to importers and repositories. In 2016 the Pome quarantine program issued the following types of releases: final releases for 14 *Malus*; provisional releases for 7 *Malus* and 3 *Pyrus* for the Pomes program. The *Prunus* quarantine program had 14 final releases as well as 14 provisional releases; the seedling program had 155 final releases. We are pleased to state that the total amount of releases for 2016 is 207. In addition, our program has ongoing collaboration with the Pomes and *Prunus* Repositories, Crop Germplasm Committees, with scientists of the National Clean Plant Network, commercial nurseries, and private growers.

ACCESSIONS IN TESTING

Prunus

As of May 2016 Tom C. Kim, Horticulturist for *Prunus* has received and established 36 accessions itemized as follows: 3 *P. salicina* accessions from South Africa; 4 *P. armeniaca* from France; 9 *P. persica* accessions from Valencia, Spain; 10 *Prunus avium* (cherry) accessions, including 1 *P. campanulata*, 1 *P. cyclamina*, 1 *P. pendula*, 1 *P. sargentii* from The United Kingdom; 6 *P. armeniaca* from France; 4 *P. domestica* from Germany. During 2016 we have a total of 340 *Prunus* accessions in Bldg 580.

Pomes

As of May 2016, Robert Jones, Pomes Crop Specialist for Pomes has received and established a total of 34 accessions itemized as follows: 21 cider apple accessions and 4 cider pears from The United Kingdom, 1 *Malus trilobata* from Scotland, UK; 2 accessions (rootstocks) from Brazil and 6 new positive controls from the Canadian Food Inspection Agency, Canada. During 2016 we have the following pome accessions: 207 Apples, 178 Pears, 34 Quinces in Bldg 580.

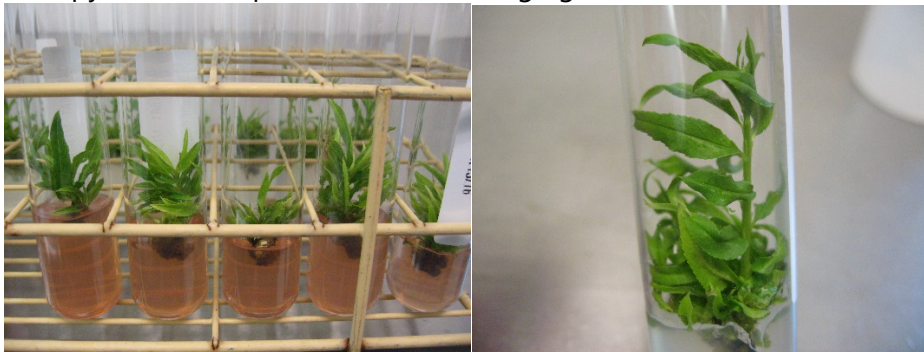
Pathogen interceptions

Every year we intercept a series of pathogens of quarantine significance in fruit trees of Pomes and *Prunus*. These ones 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 tested positive were sent to thermotherapy through *in vitro* culture. Enclosed below are some of the pathogens intercepted in incoming material: **Prunus program** Viruses: *Marafivirus*, *Nectarine stem pitting associated virus*, *Cherry virus A*, *Plum bark necrosis stem pitting associated virus*, *Little cherry virus 1*, *Little cherry virus 2*, *Prunus necrotic ringspot virus*, *Prune dwarf virus*; Viroids: *Hop stunt viroid*, *Peach latent mosaic viroid*; *Phytoplasma*; **Pomes program:** Viruses: *Apple stem pitting virus*, *Apple stem grooving virus*, *Apple chlorotic leafspot virus*; Viroids: *Apple fruit crinckle viroid*, *Pear blister canker viroid*.

Therapy-Tissue Culture

Richard Slocum, Tissue Culture Scientist, 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. His latest accomplishment has been to be able to do tissue culture of almonds and keep them for several growing seasons in tissue culture. At this time he will continue working on the survival of the material post therapy, which has proven to be challenging.



Prunus dulcis

Releases approved by Dr. J. Foster in 2016

Crop Type	Final Release	Provisional Release	Total Released 2016
Pomes accessions by B. Jones	<i>Malus</i> - 14 <i>Pyrus</i> -0 <i>Cydonia</i> -0 Total: 14	<i>Malus</i> -7 <i>Pyrus</i> -3 <i>Cydonia</i> -0 Total: 10	<i>Malus</i> -21 <i>Pyrus</i> -3 <i>Cydonia</i> -0 Total: 24

Prunus accessions by Tom C. Kim	<i>Prunus</i> -14	<i>Prunus</i> -14	<i>Prunus</i> -28
Prunus- *seedlings *by J.Foster/D. Johnson	155	0	155
Total	Final	Provisional	Total 207

Crop	FY207	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13	FY 14	FY15	FY16
Pome Fruits	2	0	23	57	48	100	72	32	59	24
<i>Prunus</i> clones	6	17	33	16	50	41	35	20	23	28
<i>Prunus</i> *seedlings	31	70	138	196	111	107	332	247	204	155
Total per year	39	87	194	269	209	248	439	351	286	207

Release Summary: 2007-2016

Pathogen detection procedures submitted in 2016

- A. One step multiplex for the detection of four *Nepoviruses*: ToRSV, BBLMV, BCRV, CLRV (*Nepovirus* 3 Group)
- B. *Nepovirus* tests for ArMV, TBRV, RpRSV, SLRSV

2016 Relevant Collaboration

Dr. Ruhui Li, Dr. Gary Kinard- USDA-ARS: NGS for Quarantine Program
 Visit to Foundation Plant Services, Davis, CA, Topic: NGS. Hosts: Dr. Maher Al-Rwahnih and Dr. Deborah Golino.

Dr. Mike Rott, Agriculture Canada-Topic: NGS protocols in use in Canada-Conference call

New Personnel at PGQP

Martha Malapi-Wight, Ph.D. is the new Lead Plant Pathologist for the Poaceae Quarantine Program. Dr. Malapi-Wight joined the PGQP program in December 2015. She will be working on the quarantine of her assigned crops, as well as assisting PGQP in moving forward on the implementation of NGS for diagnostics for quarantine purposes.