

**ANNUAL REPORT FOR CALENDAR YEAR 2009**  
**USDA ARS**  
**National Clonal Germplasm Repository**  
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**National Clonal Germplasm Repository  
Staff**

**Permanent/Term Federal Staff**

Bruce Bartlett, Ag. Sci. Tech., Plant Distribution  
Nahla Bassil, Geneticist-Plants  
Ted Bunch, Bio. Sci. Tech, Genetics  
Douglas Cook, Computer Specialist  
DeNoma, Jeanine, Bio. Sci. Tech, TC  
Missy Fix, Bio. Sci. Tech., Plants  
Kim Hummer, Research Leader/Curator  
April Nyberg, Bio. Sci. Tech., Genetics  
James Oliphant, Bio. Sci. Tech., Greenhse. Mgr.  
Yvonne Pedersen, Program Assistant  
Joseph Postman, Plant Pathologist/Pear Curator  
Barbara Reed, Research Plant Physiologist  
Joe Snead, Ag. Sci. Tech., Field Manager  
Dennis Vandevveer, Facilities Manager



(Left) Joseph Postman, Pome Fruit Curator, Barbara Ghazarian, Quince Expert, and Diana Brinn, Master Gardener, at the *Unappreciated Fruit Event*, October 2009.

**Temporary Staff and Students**

Curtis Barnhard, Wk. Study  
Dana Beaty, ARF, TC Lab  
Emily Beezhold, Bio. Sci. Aid, TC  
Emily Bouldin, Wk. Study  
Andy Brooks, Bio. Sci. Aid, Field  
Adam Cartmill, Wk. Study  
Erin Conley, Bio. Sci. Aid, TC  
Randy Cram, STEP  
Priscilla Harlow, Wk. Study  
Gordon Hilberg, Wk. Study  
Jason Hotchkiss, Bio. Sci. Aid  
Kimberly Kittridge, Bio. Sci. Aid, TC  
Brandon Mahon, Wk. Study  
Matt Oleman, Wk. Study  
David Olsen, Bio. Sci. Aid  
Jane Olson, Bio. Sci. Aid  
Chelsea Rayford, Wk. Study  
Corey Robbins, Bio. Sci. Aid  
Anthony Shireman, Bio. Sci. Aid, TC  
Jesse Showers, Wk. Study

**Graduate Students and Visiting Scientists**

Danny Dalton, GRA, Horticulture  
Charles Hand, GRA, Horticulture  
Wambui Njuguna, GRA, Horticulture  
Sukalya Poothong, GRA, Horticulture  
Esther Uchendu, GRA, Horticulture  
Sugae Wada, GRA, Horticulture

**Collaborators**

Francis J. Lawrence  
Maxine Thompson  
Melvin Westwood

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## Corvallis Major Accomplishments for 2009

### Service

- NCGR received 521 plant requests and 5,821 items were shipped in 2009. Each year more people find our repository through our website and the GRIN shopping cart so our order processing is up. Less than one fourth of our distribution was international.
- NCGR staff organized the 2<sup>nd</sup> ISHS International Symposium on Molecular Markers in Horticulture, 29 July 29 – August 1 2009 in Corvallis, Oregon. More than 100 participants toured the repository: <http://oregonstate.edu/conferences/event/molecularmarkers2009/>
- NCGR staff with OSU Department of Horticulture, and the Horticultural Crops Research Unit hosted an open house on 17-18 July 2008. More than 200 public attendees toured the Lewis Brown Horticultural Research Farm and the Repository collections of blueberries and pears.
- NCGR scientists collaborated with NCGRP on the long-term storage of *in vitro* and cryogenic accessions. We provided techniques and plant materials of blueberries, black and red currants, and pears for cryopreservation of the dormant shoots in liquid nitrogen.
- NCGR staff transferred a protocol for cryopreservation of blueberry accessions to NCGRP for use in long term germplasm storage.
- NCGR staff served on National Plant Germplasm System representative of the National Governing Board for new USDA National Clean Plant Network. The Governing Board developed request for proposals, reviewed submitted proposals, and award a total of \$3.1 million to improve health at 5 foundation plant material centers.
- NCGR staff participated in a 3 week USDA funded expedition to Japan to collect temperate fruit and berry germplasm. Samples included five seedlots representing unique sources of *Corylus heterophylla* and *C. sieboldiana* from northern Honshu and three seedlots of *Pyrus ussuriensis* that represent a rare relict population of the only pears to have truly originated in Japan. These populations may also be the progenitors of many cultivated Japanese pears.
- NCGR staff chaired the Genetics and Germplasm Working Group in the ASHS, organized a Workshop ‘Standardized Phenotyping: Advantages to Horticulture’ at the annual conference in St. Louis, MI.
- NCGR staff organized the ‘Fruit and Nut Crops’ Workshop at the Plant and Animal Genome XII Meeting, in San Diego, on January 10, 2009.

### Research

- Determined that many native Oregon strawberries (*Fragaria virginiana* subsp. *platypetala*) distributed on the western side of the Oregon Cascades have 10 sets of chromosomes (are decaploid), not 8 sets (octoploid), as was previously reported.
- Determined that aeciospores and urediniospores infect black currants equally and can both be used to determine white pine blister rust susceptibility.
- Determined relative blooming phenology in Corvallis for black, red, and ornamental currants and gooseberries averaging over the past decade.
- Determined that antioxidant compounds double the regrowth of cryopreserved shoot tips.
- Determined that seed coat thickness and hardness are the most important factors controlling seed dormancy in *Rubus* species seed.
- Initiated a three year project was initiated to evaluate the NCGR quince collection (*Cydonia oblonga*) for cold hardiness. Lack of cold hardiness and sensitivity to fire blight are limitations to wider use of quince as a dwarfing rootstock for pears. Several clonal *Cydonia* accessions, including

samples from Poland, Germany and Turkmenistan, were found to have levels of dormant stem cold hardiness comparable to that of the most cold-hardy pear accessions.

- Applied EST-SSR technology to fingerprint 146 pear accessions and submitted the article- Article was accepted on 8/3/2009 and published on Sept 11, 2009. Uploading to GRIN awaits final revisions.
- Fingerprinted four Ohelo berries and 28 representatives from nine species in *Vaccinium* section *Myrtilus*.
- Determined improved media for use with difficult to grow *Pyrus* accessions.
- Developed an SSR-based identification protocol for IQF blackberries and fingerprinted 16 of the most important western cultivars.

### **Non-base and Extramural Funding for the USDA-ARS NCGR- Corvallis**

#### **FY 2010**

Amount	Purpose	Source
128,000	RosBreed2010	CSREES
8,500	Quince evaluation JP	NPS, Germplasm evaluation
4,000	GRIN update for nut evaluation – KH	NPS, Germplasm evaluation
15,000	Additional Trusts - NB	Matching for Blueberry SCRI
69,060	Blueberry genetics – NB	SCRI – carryover funding
51,400	Ohelo tc, cryo, id – KH , BR	SCRI – carryover funding
22,000	Tissue culture of pears - BR	OAN- ODA
30,324	Tissue culture of hazelnuts – BR	Oregon Hazelnut Com.
328,284	Total	

#### **FY 2009**

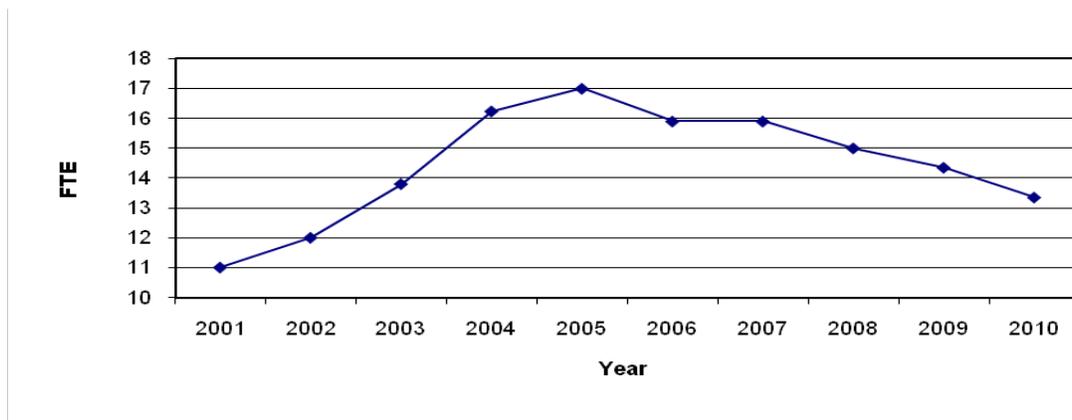
Amount	Purpose	Source
10,000	White pine blister rust on Ribes - KH	NW Center Small fruit
12,500	Azores cooperative grant - KH	OIRP
2,200	Summer Student intern – BR	ARS PWA
77,411	Blueberry identification – NB	SCRI – carryover funding
51,734	Ohelo tc, cryo, id – KH BR,and NB	SCRI – carryover funding
19,800	Tissue culture of pears - BR	OAN- ODA
29,156	Tissue culture of hazelnuts – BR	Oregon Hazelnut Com.
29,000	Plant Exploration to Hokkaido – KH and JP	USDA Exploration Grant
231,801	Total	

### **Budget and Fiscal**

Our base funding for Corvallis has remained at about \$1.4 million for the past five years. One big difference in our operation this year is the success of our scientists (go team!) in obtaining supplemental non-base funding. During 2009-2010, this non-base funding has increased to about one fourth of our total funding. New grants, such as the CSREES Specialty Crop Research Initiative,

provided additional opportunities to form coalitions with agricultural and horticultural industries with national and international scientists to focus on research that provides answers to specific priority questions. The projects that we are working on here are closely related to genetic resource conservation and evaluation activities in assigned crops.

### Staffing supported by Federal base funds.



### Staffing Changes

In December 2009, the USDA ARS Arctic and Subarctic Plant Genetic Resources Unit in Palmer, Alaska was administratively merged as a worksite with the Corvallis National Clonal Germplasm Repository under the management of Kim Hummer as Research Leader. While 2,570 miles separate the two locations, many aspects of clonal genebank management unite their efforts.

Corvallis will continue to focus on pears, quince, strawberries, blueberries, cranberries, raspberries, blackberries, hardy kiwifruits, hazelnuts, butternuts, and hop and other specialty crops. Both units have objectives to collect, maintain, distribute, evaluate and document phenotypic and genotypic information concerning their assigned crops. The Palmer unit will focus on conservation of mints, peonies, currants, gooseberries, and rhubarb, in addition to 25 additional genera of agronomic reclamation interest to arctic and subarctic regions. Each genebank will backup some collections for the other location.

At the Corvallis genebank, base funding is limited. Our scientists actively sought funding from many non-base sources. Term and temporary technical support employees, Ted Bunch, Tony Shireman, and Erin Conley, were hired on non-base funding from specialty crop research initiative (SCRI) grants. We are thankful for these new grants. They are really making a difference in our capacity and productivity.

Our graduate students worked hard this past year. Four of them graduated, successfully completing 1 MS and 3 Ph. D. degrees. Congratulations to: Danny Dalton, Esther Uchendu, Sugae Wada, and Wambui Njuguna for the successful completion of their graduate programs at Oregon State University, Department of Horticulture.

### **EEO/CR/Outreach**

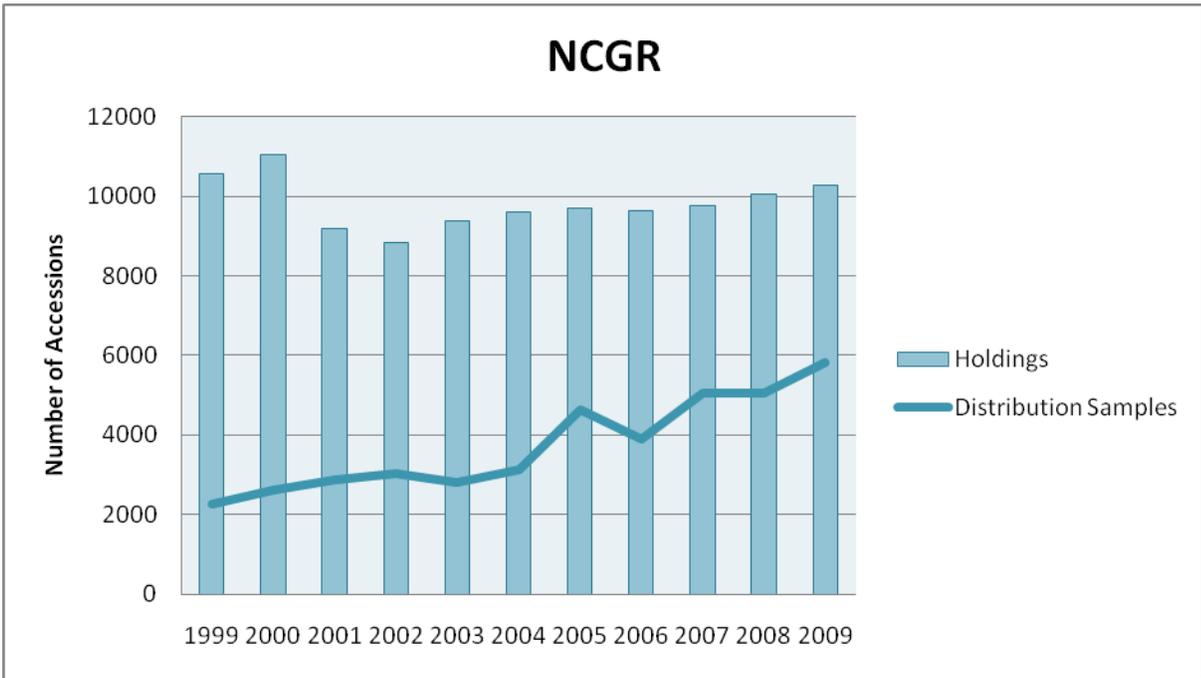
- The Corvallis location has a very active CODEOC, an EEO outreach committee. Dr. Nahla Bassil contributed as chair of the committee, and received the location EEO award for 2010.
- Through Research Support Agreement with Oregon State University three female and one male graduate student were trained. Two of these students were women of color; one Asian; one disabled. Three of these students graduated in 2009 and in the first quarter of 2010.
- During the winter, 15 disabled high school students (program was funded through local school district grant) were trained in greenhouse management activities.
- During the winter an additional 3 disabled individuals from a local private organization (Work Unlimited) were trained in strawberry greenhouse activities.
- Three disabled individuals have temporary federal technical appointments on our staff.

### **View from the Front Office**

Recently large funding sources have recognized that the security of the world's food supply depends on the conservation of plant genetic resources. **Support for the Svalbard World Seed Bank.** We understand that the President's budget for 2011 includes increase for preservation of plant genetic resources. We are encouraged that the conservation of plant genetic resources is receiving resurgence of interest in the present world political arena.

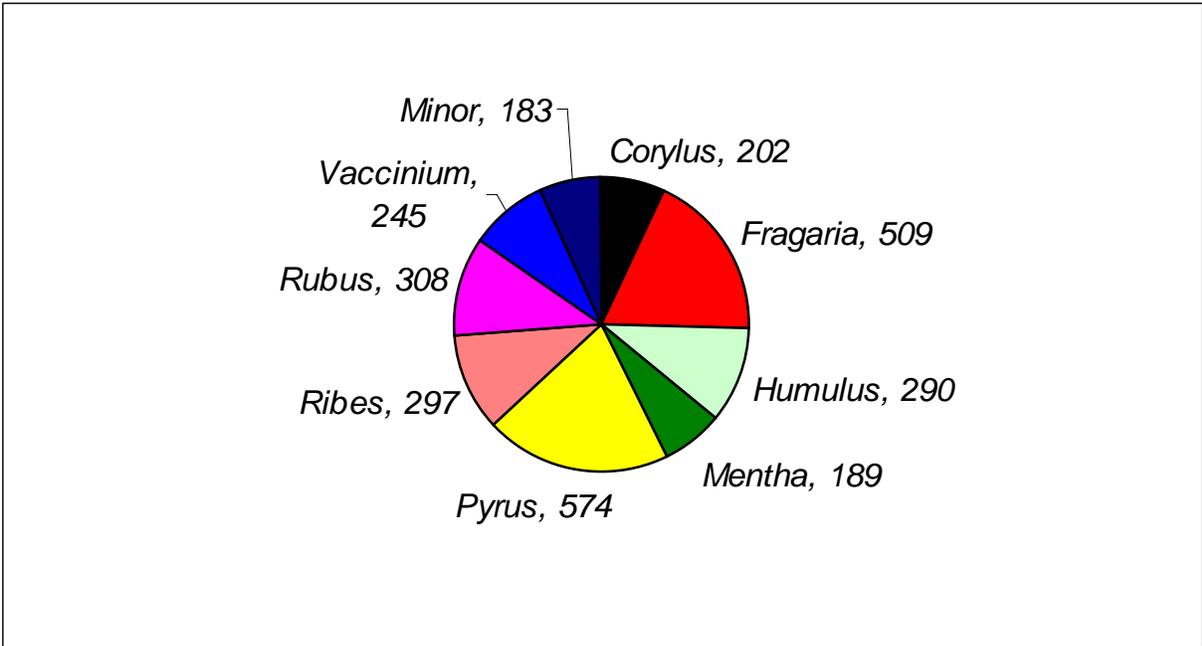
We are encouraged by efforts of the National Clean Plant Network, a new initiative to promote healthy foundation plant material for nurseries. Joseph Postman is our unit's and the NPGS representative, on this important committee. This committee will offer grants possibilities for the improvement of plant health in tree fruit, hop, and in the berry crops. We will be working closely with these NCPN groups to provide plant material improve health of foundation material for horticultural industry use.

**In December 2009, Dr. Andrew Hammond, our Area Director, assigned the management of the National Arctic and Subarctic Plant Genetic Resources Unit in Palmer, Alaska, under the supervision of Dr. Kim Hummer, Research Leader at the NCGR-Corvallis. The decision for this assignment was based on programmatic issues to improve efficiency in plant genetic resource conservation management.**



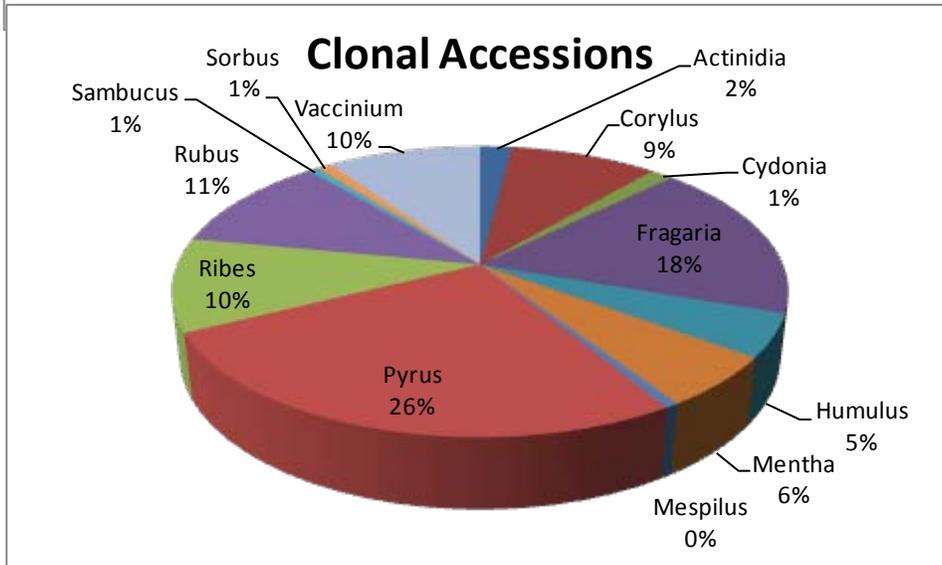
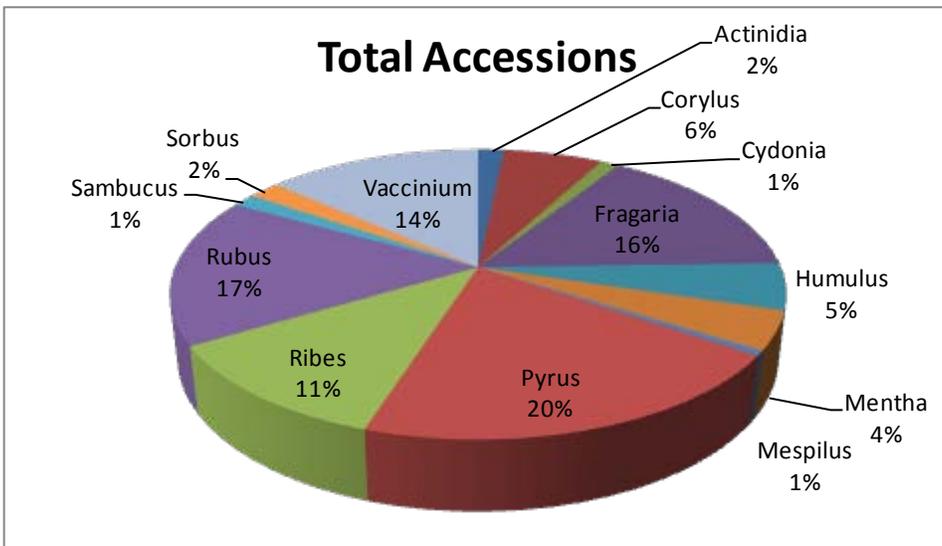
**Plant**

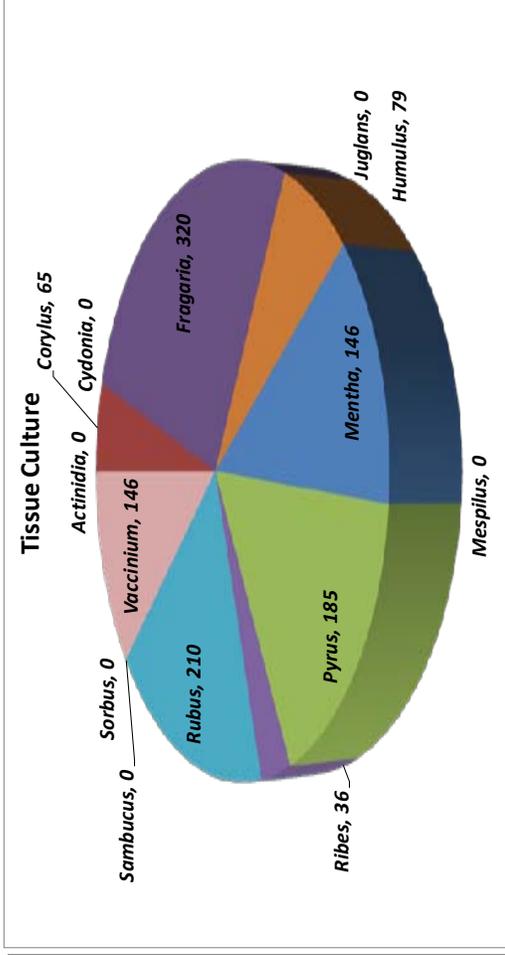
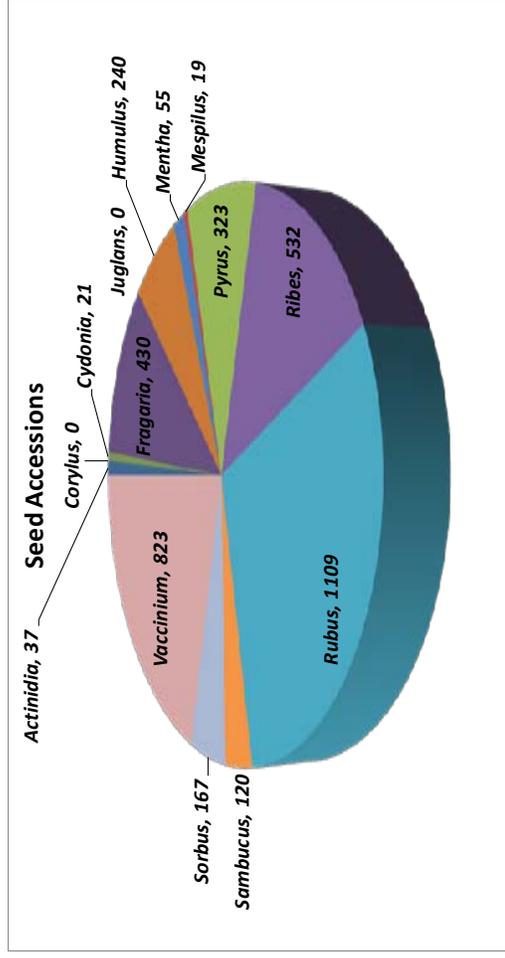
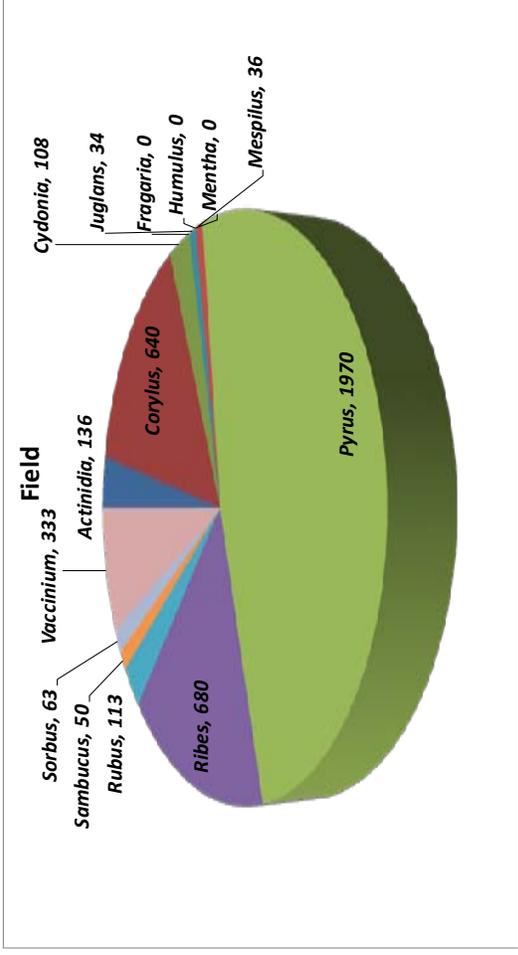
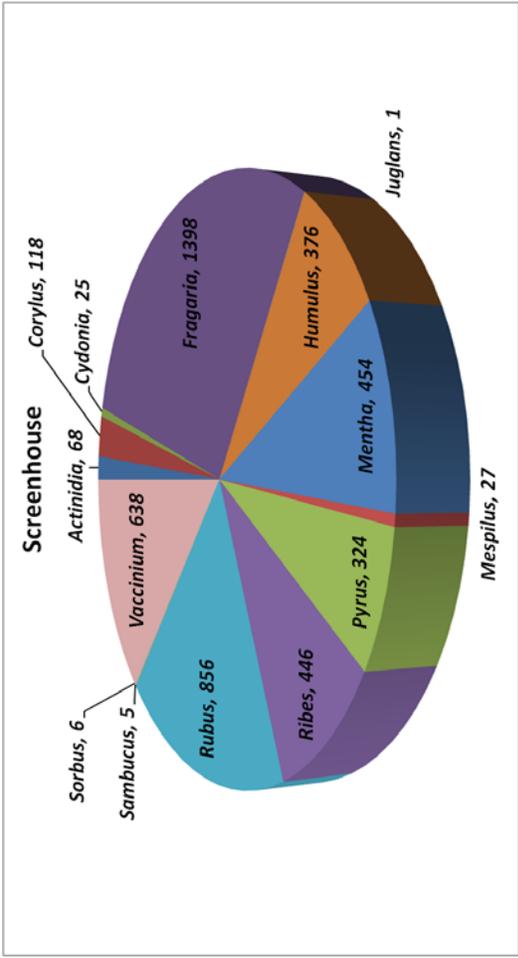
**Distribution: A Record of 5,821 accessions from Corvallis shipped in 2009.**



**NCGR Corvallis – 2009 Accession Summary for major collections (counts from 3/26/2010)**

genus	total accessions	seed accessions	clonal			tc
			accessions	screenhouse	field	
<i>Actinidia</i>	196	37	159	68	136	0
<i>Corylus</i>	737	0	737	118	640	65
<i>Cydonia</i>	135	21	114	25	108	0
<i>Fragaria</i>	1837	430	1407	1398	0	320
<i>Juglans</i>	35	0	35	1	34	0
<i>Humulus</i>	617	240	377	376	0	79
<i>Mentha</i>	509	55	454	454	0	146
<i>Mespilus</i>	63	19	44	27	36	0
<i>Pyrus</i>	2418	323	2095	324	1970	185
<i>Ribes</i>	1360	532	828	446	680	36
<i>Rubus</i>	1970	1109	861	856	113	210
<i>Sambucus</i>	172	120	52	5	50	0
<i>Sorbus</i>	233	167	66	6	63	0
<i>Vaccinium</i>	1597	823	774	638	333	146





## New Accessions in 2009:

### *Corylus*

- Thirty-six clonal accessions were added including seedlings of *C. colurna* from Georgia, seedlings of *C. avellana* from Georgia and Azerbaijan and 7 EFB resistant selections from the Oregon State University breeding program. Five seedlots representing unique sources of *C. heterophylla* and *C. sieboldiana* from northern Honshu were collected by J. Postman and K. Hummer during their Japan expedition.

### *Cydonia*

- Three *C. oblonga* clonal accessions were added: a replacement for misidentified cultivar 'Van Deman', a seedling of a fire blight resistant cultivar from Bulgaria, and a rare yellow flesh quince discovered by a grower in southern California.

### *Fragaria*

- One hundred-eleven seed and plant accessions were added including a wild strawberry species from Kyrgyzstan, samples of *F. iinumae* and *F. nipponica* from Japan, and populations of *F. vesca*, *F. virginiana* and *F. x ananassa* from the SE United States.

### *Pyrus*

- Three seedlots of *Pyrus ussuriensis* collected during the Hummer-Postman Japan expedition may represent a rare relict population of the only pears to have truly originated in Japan and may also be the progenitors of many cultivated Japanese pears. A population of 8 *P. salicifolia* seedlings was grown from a seedlot collected in Azerbaijan during an NPGS funded expedition, and are the first accessions of the species from that country. Three new clonal accessions from Nepal, Pakistan and Poland were received from the USDA quarantine station. Seedlings of *P. communis* ssp. *Caucasica* grown from seed recently collected in Armenia were received from the Woody Landscape Plant Genebank in Beltsville, and a replacement clone of the hybrid pear cultivar 'Pineapple' was obtained from a grower in Tennessee, since the identity of that clone in the NCGR collection is in question.

### *Rubus*

- Twenty-one *Rubus* seedlots and 32 plant inventory records were added. Most of the seedlots came from the Japan expedition. New plant accessions included raspberry cultivars from Canada, and black raspberry and hybrid berry selections from the Oregon USDA breeding program.

### *Vaccinium*

- Sixty-five mostly seed accessions were added. Several samples each of *V. smallii*, *V. oldhamii*, *V. hirtum*, *V. praestans* and *V. oxycoccus* were collected in Japan, and a number of *V. reticulatum* were received from Hawaii as part of the Ohelo berry project.

## Plant Pathology 2009:

- The NCGR *Corylus* collection continues to be free of Eastern Filbert Blight.
- Pear and Quince field collections were evaluated for natural incidence of scab (pear only), mildew, fire blight (quince only), rust and *Fabraea* leafspot.
- About one hundred *Corylus* accessions were assayed for Apple mosaic virus by ELISA.

## Characterization, Documentation, Evaluation

- Development of Dormant Bud Cryogenic Storage capabilities continues in collaboration with David Ellis and Maria Jenderek at NCGRP, Fort Collins, Colorado using several *Pyrus*, *Ribes* and *Vaccinium* accessions in trials.
- With funding from the Washington Tree Fruit Research Commission, we evaluated the quince collection monthly for cold hardiness beginning in September and propagated quince trees for whole-tree freezing studies to be performed in the winter of 2010-11.
- Scanning of leaves for GRIN vouchers:
  - *Fragaria* 330 images
  - *Humulus* 175 images
  - *Rubus* 180 images

## Website Visits for Calendar Year 2009 - Top 15 Pages:

Pages	Visits
Home	9989
NCGR-Corvallis - Actinidia Germplasm	2312
NCGR-Corvallis - Rubus Germplasm	2279
Products and Services - Distribution Policies	2108
NCGR-Corvallis - Pyrus Germplasm	1766
NCGR-Corvallis - Humulus Germplasm	1600
NCGR-Corvallis - Fragaria Germplasm	1549
NCGR-Corvallis - Ribes Germplasm	1379
NCGR-Corvallis - Corylus Germplasm	1114
NCGR-Corvallis - Vaccinium Germplasm	1110
Products and Services - Catalog Index	988
NCGR-Corvallis - Asimina Germplasm	875
People & Places - Staff Directory	727
NCGR-Corvallis - Cydonia Germplasm	721
NCGR-Corvallis - Mespilus Germplasm	495

At right: Invited speakers at the *Unappreciated Fruits Event* (L-R) Kim Hummer, Maxine Thompson, Joseph Postman, Chad Finn, Barbara Ghazarian, David Karp, Susan Dolan, Jules Janick.



## **Facilities - by Dennis Vandever**

We are working within the federal mandate to have “greener” operations. I volunteered for the Safety/EMS committee. Numerous T12 ballasts and tubes were replaced with T8 electronic ballasts and tubes; replaced additional office light switches with motion controlled switches. We continue looking for an electric vehicle for farm use that can achieve a speed of 55 mph between farms. We continue to recycle metal, plastics, paper, cardboard, used engine oil, hydraulic fluid, antifreeze and electronic equipment.

During 2009 we replaced vinyl on sections of the main building and replace rotted T-111 on the West, East and north side of the main building. Additional vinyl replacement is needed on the shop building and will be repaired as funding comes available in the near future.

We repaired the N. farm domestic well with a new down pipe, pump and foot valve which had eroded and had sever leaks pumping air in to the main system.

New swamp cooler racks were fabricated and totally rebuilt two swamp coolers. Eight swamp cooler motors were replaced with Green Star energy efficient motors. Rebuilt roof mount blowers for cryogenics labs flow hood with new motors and new shafts.

Repaired numerous HVAC and cooling systems including growth chambers. We repaired two irrigation controllers at the N. farm and replaced three phase blower motor for the main HVAC system.

Repaired screenhouse 10 eaves by removing and replacing a 12 foot section with new pressure treated 2X4s. Replaced rotted lath on the front of screenhouses with over 8000 linear feet of trex. Replaced caulking in the roof eave of screenhouse 10. Installed a complete dual 4 zone, 40 station irrigation system including timer controls and 1600 sq. ft. of weed matting and installed 20 benches in the tubehouse. New underground water and electrical supply were moved from screenhouse 9 to the tubehouse. I removed 20 strawberry planting boxes and all soil from the planting area.

Four vehicles were replaced with new vehicles under the “Junker Law”.

Maintenance was provided for six vehicles and five tractors plus numerous pieces of farm equipment, small engines and sprayers. Although our vehicle/tractor fleet is aging I have maintained a 95% operational status throughout the year.

Other projects included painting of exterior doors, door replacement for the TC lab growth room, re-striping of all parking lots to include handicapped parking, plumbing repairs, minor electrical repairs, lighting upgrades and security badges and coding. Monitoring and adjusting the Lenel security and CCTV systems. I remain point of contact, technical consultant and initial SOW generation for contracts.

## **Awards 2009**

Compiled by: Yvonne Pedersen

Bruce Bartlett – Performance Bonus Award for superior performance for the rating period of 10/1/2008-9/30/2009.

Nahla Bassil –Performance Bonus Award for highly superior performance during the rating period of 10/1/2008-9/30/2009.

Jeanine DeNoma –Performance Bonus Award for superior performance during the rating period of 10/1/2008-9/30/2009.

Missy Fix – Performance Bonus Award for superior performance during the rating period of 10/1/2008-9/30/2009.

Kim Hummer - Quality Step Increase for outstanding performance during the rating period of 10/1/2008-9/30/2009.

James Oliphant – Performance Bonus Award for superior performance during the rating period of 10/1/2008-9/30/2009.

Yvonne Pedersen – Quality Step Increase for outstanding performance during the rating period of 10/1/2008-9/30/2009.

Joseph Postman – Performance Bonus Award for superior performance during the rating period of 10/1/2008-9/30/2009.

Barbara Reed – Performance Bonus Award for highly superior performance during the rating period of 10/1/2008-9/30/2009.

Dennis Vandever – Performance Bonus Award for highly superior performance during the rating period of 10/1/2008-9/30/2009.

### **Training 2009**

Compiled by: Yvonne Pedersen

Joe Snead – Orchards Pest & Disease Management; January 2009.

Jim Oliphant, Joe Snead – Seminars on the Production and Maintenance of Small Fruits (credit towards pesticide applicators license renewal); January 2009

Missy Fix, Jim Oliphant, Joe Snead – Pesticide Application Training; January 2009.

Bruce Bartlett – Integrated Pest Management; February 2009.

Missy Fix, Jim Oliphant – Seminars on the Production and Maintenance of Small Fruits (credit towards pesticide applicators license renewal); July 2009

Joe Snead – Blueberry Field Days; July 2009

Doug Cook, April Nyberg, Kim Hummer, Ted Bunch, Joseph Postman, Corey Robbins – CPR/AED training.

All employees completed the annual AgLearn training of Information Systems Security Awareness, Civil Rights, and Re-inventing Diversity for Today's USDA Training in 2009.

Joseph Postman and Yvonne Pedersen continue to participate in the monthly ARS Site Publisher teleconference/training.

### **Travel 2009**

Compiled by: Yvonne Pedersen

Kim Hummer – Raleigh, North Carolina, to attend the NCCC-22 (Small Fruit Crop Germplasm Committee Meeting); October 2008.

Joseph Postman – Denver, Colorado, to attend the Fruit Tree Commodity Committee supporting the USDA National Clean Plant Network; December 2008.

Joseph Postman –Eugene, Oregon, to give presentation to the Osher Lifelong Learning Institute group; December 2008.

Nahla Bassil – Woodburn, Oregon, to attend the Raspberry/Blackberry Meeting; December 2008.

Nahla Bassil – San Diego, California, to organize the Fruit and Nut Crops Workshop and attend the Plant and Animal Genome Meeting; January 2009.

Deb Tyson, Jim Oliphant, Joe Snead – Woodburn, Oregon, to attend the Organic Crops seminar; January 2009.

Joseph Postman, Joe Snead – Portland, Oregon, to attend the Western Orchards Pest & Disease Management Conference; January 2009.

Jim Oliphant – Canby, Oregon, to attend the Berry Conference; January 2009.

Kim Hummer – Portland, Oregon, to attend the Western Orchards Pest & Disease Management Conference; January 2009.

Kim Hummer – Bodega Bay, California, to attend the Juglans Crop Germplasm meeting; January 2009.

Missy Fix, Joe Snead, Jim Oliphant – Portland, Oregon, to attend Pesticide Certification class; January 2009.

Joseph Postman – Hood River, Oregon, to attend the Northwest Pear Research Review; February 2009.

Joseph Postman – Miami, Florida, to attend the Woody Landscape Plant Crop Germplasm Committee; March 2009.

Kim Hummer– the Azores, blueberry site visit and Apple DNA collection; March 2009.

Joseph Postman – Washington, DC, attend the USDA National Clean Plant Program meeting; March 2009.

Barbara Reed – Germany and Belgium, to attend and present at the International Society for Horticultural meeting and site visit; March 2009.

Joseph Postman – Riverdale, Maryland, to attend the National Clean Plant Network Meeting; May 2009.

Barbara Reed – Charleston, South Carolina, to attend the Society of In Vitro Biology Meeting; June 2009.

Joseph Postman – Battle Creek, Michigan, to attend the Fruit Tree and Small Fruit meeting; June 2009.

Jim Oliphant, Deb Tyson, Missy Fix, Nahla Bassil, Joe Snead, Corey Robbins, Randy Cram – Aurora, Oregon, to attend the Caneberry Day Event; July 2009.

Jim Oliphant, Deb Tyson, Joe Snead, Corey Robbins – Aurora, Oregon, to attend the Blueberry Field Day Event; July 2009.

Kim Hummer – Sturgeon Bay, Wisconsin, to attend the Plant Germplasm Operations Committee; July 2009.

Barbara Reed – Malaysia & Japan, invited to speak at the University of Kebangsaan Malaysia and to attend the Society for Cryobiology Meeting in Japan; July 2009.

Nahla Bassil, Kim Hummer – St. Louis, Missouri, to attend the ASHS Conference; July 2009.

Joseph Postman – Riverdale, Maryland, to attend the National Clean Plant Network proposal and review and attend the ASHS meeting; July 2009.

Joseph Postman – Portland, Oregon, to attend the American Phytopathological Society meeting; August 2009.

Joseph Postman – Ames, Iowa, to attend the GRIN Global Technical Steering Group meeting; August 2009.

Kim Hummer – Davis, California, to attend participate on the Evaluation Committee; August 2009.

Barbara Reed – Germany, attend Society for Low Temperature Biology and invited to lecture on cryobiology; August 2009.

Kim Hummer – Japan, specimen collection trip; September 2009.

Joseph Postman – Japan, specimen collection trip; September 2009.

Kim Hummer – Sweden, to accept honorary degree; September 2009.

Nahla Bassil – Corvallis, Oregon, to attend CGRB meeting; September 2009.

Nahla Bassil – Wenatchee, Washington, to attend/participate on the Apple CGC tour and meeting; October 2009.

Joseph Postman – Richland, Washington, to attend participate on the Governing Board Meeting of the National Clean Plant Network; October 2009.

Kim Hummer – Portland, Oregon, to attend the AISES National Conference; October 2009.

Barbara Reed, Kim Hummer – Hilo, Hawaii, SCRI site visit; November 2009.

Joseph Postman – St. Louis, Missouri, to attend the National Clean Plant Network meeting; November 2009.

Contributed travel, paid for by inter/intra agency or outside private funds. “Acceptance of funds from non-federal source is in accordance with FTR Chapter 304-1.”

### **Visitors 2009**

by: Yvonne Pedersen

During Calendar Year 2009, 471 people came through the Repository’s front door. Guests arrived in large or small groups, or as individuals. In addition to the 471 people, over 100 people attended the 2009 Open House held in July.

In July, the Open House was a combined effort between NCGR, HCRL (Hort Crops Research Lab), OSU’s Department of Horticulture, and the City of Corvallis DaVinci Days festival with approximately 200 individuals exploring the cherry research trials, vegetable breeding plots, blueberry irrigation research, berry breeding, pear collection, and taste samples of fruits of the season. In October, An “Unappreciated Fruits Seminar” event was held with the Horticulture Department of OSU. Activities started in the evening with a book signing of featured author Barbara Ghazarian and her book “Simply Quince”. The following day, other authors were met at a reception followed by a quince themed dinner offered by one of Corvallis’ local restaurants. The last day started with visiting the Corvallis Farmers Market’s Master Gardener’s booth and then unappreciated fruit tasting held at the National Clonal Germplasm’s site off Peoria Road

Some groups used the Repository for their annual meetings such as the Oregon Hazelnut Commission, the Oregon Sweet Cherry Commission, and the Oregon Processed Vegetable Committee. Educational tours ranging from groups of 8 to 20 came from Willamette University, Home Orchard Society, Master Gardener Group, Oregon State University, Philomath School District, Evergreen University, various garden clubs, Corvallis School District, Linn Benton Community College, as well as the Greater Albany Public Schools to tour the facility for their horticultural experience. In addition, the Corvallis Outreach Diversity and Equal Opportunity Committee arranged a tour to visit the three ARS Corvallis units for students and others interested, to see what the other units are researching.

There were also numerous general visitors from around the world: 1 each from Argentina and Korea; 2 from South Africa, Kazakhstan, Uruguay, Germany, and Kenya, 3 from Thailand; 4 from China; and 15 from Chile. Also, there were graduate students working at the National Clonal Germplasm Repository from Kenya, Nigeria, Thailand, and Japan.

## Information Management/Computer Operations Computer/Information Management

By Douglas Cook and Kim Hummer

### GRIN Records

**Table GRIN Records Activity during CY 2009**

<b>GRIN Area</b>	<b>Created</b>	<b>Modified</b>
Accession	13363	698
Inventory	842	830
Observation/Voucher	11225	1
Pathogen	0	0
Distribution	427	6
Cooperator	156	21
<b>Total</b>	<b>26013</b>	<b>1556</b>

This year there were 114 new accessions and other sub-tending data category records added to GRIN (587 Accession Names, 96 Name Changes, 46 Habitat, 5 Narratives, 576 Pedigree, 213 Source, 369 Source Members, 127 Quarantine Records, 11224 Observations, 5 IPR and 1 Voucher). There were 525 new Inventory records and 317 Inventory Actions added to GRIN. For Distribution there were 3 Orders, 6 Order Actions, 418 Order Items and 156 Cooperator records add. Among 698 existing accession records, and other sub-categories, modifications were made during the year (107 Accessions, 106 Accession Names, 66 Habitat, 9 Narratives, 85 Pedigree, 1 Voucher, 2 IPR, 1 Quarantine and 321 Source records). There were 450 Inventory, 380 Inventory Actions, 6 Order Items and 21 Cooperator records modified.

### Hardware and Infrastructure

All workstations operate with at least a 2.0 MHz CPU, 2 GB of memory and use Windows® XP-Pro software. All workstations are equipped with uninterruptible power, anti-virus and the network is firewall protected. Two new workstations were purchased. Numerous minor computer software configurations and hardware repairs took place. The no major events occurred during the year.

### Field Report

By Joe Snead

There has not been a lot of change in the field collections for 2009 growing season. Each of the field collections grew a small amount. The *Ribes* field collection was undergoing a major renewal and this was completed in early 2010.

On Lewis Brown Farm the *Vaccinium* collection was prepped for an annual farm field day for the general public. This was quite successful. The people got to roam the collection just past peak fruit season. Several staff members were in the field to guide and educate the public. At the main entrance to the Pyrus collection a station was set up to educate the public about the collection. Unfortunately the event occurred before fruiting season.

In the *Corylus* collection Eastern Filbert Blight remains a concern. An intensive spray program has seemingly been successful so far. Monitoring for the disease has found no outbreaks so far.

The North Farm germplasm collections are in good shape. The minor genera collections are growing quite well. The quince collection had some outbreaks of Fire blight. The cultural control methods were not enough to control the disease. In 2010 new biological control agents and new organic fungicides will be sprayed in the field at bloom. These materials have been reported to work well. The *Actinidia* field produced quite well this season. The frost protection irrigation did its job quite well. The *Actinidia* field and quince field were used as a weekend visit site for the Home Orchard Society.

Plans were made to move the *Lonicera* collection to the North farm. A site was picked out and new rows are being formed for planting in the fall. A large group of mature seedling plants is going to be maintained next to the collection as a display planting until the permanent collection sizes up.

Many of the trees in the *Juglans* collection are producing nuts. Nuts were collected from many of the trees and data was collected from the nut samples. Scion wood was collected with the pruning tower as the best material could be reached. Afterwards the trees were pruned and opened up with the use of the tower.

The repository continues to lend out plot ground to other ARS units for research. There are three ARS scientist and one OSU professor using seven acres in total. A fourth ARS scientist works in conjunction with the repository on the hops collection. The North farm is a busy place in the spring and summer with many users in the greenhouse areas. A Porta-potty was placed near the greenhouses for the many seasonal staff to use. This simplified security issues quite a lot. Every person does not receive a key and a code to get into the blue barn.

The biggest news of the year for the field has been in staff reassignments. Since I was unable to keep up with the resources available some of my duties have been resigned. Joseph Postman has been assigned the care of the *Pyrus* and *Corylus* field collections. Jim Oliphant has been assigned the care of the *Vaccinium* field collection. This lightened my load considerably.

## ***1.1 Annual Report***

Barbara M. Reed - Calendar year 2009

Major Accomplishments:

1. Determined that antioxidant compounds double the regrowth of cryopreserved shoot tips.
2. Determined that seed coat thickness and hardness are the most important factors controlling seed dormancy in *Rubus* species seed.
3. Determined improved media for use with difficult to grow *Pyrus* accessions.
4. Transferred a protocol for cryopreservation of blueberry accessions to NCGRP for use in storing the germplasm.

## **Tissue Culture and Cryopreservation**

By Barbara M. Reed and Jeanine DeNoma

## The In-Vitro Collection 2009

The *in-vitro* collection contains mostly the core and other highly requested accessions. Technician Jeanine DeNoma and helpers Kim Kittredge, Anthony Shireman and Erin Conley collected new accessions as plants were available. The spring and summer explanting season resulted in over 300 accessions successfully initiated into culture and cold stored. Both the *Vaccinium* and *Fragaria in-vitro* collections increased significantly. By December 1235 accessions were in culture and most were in storage (Fig. 1).

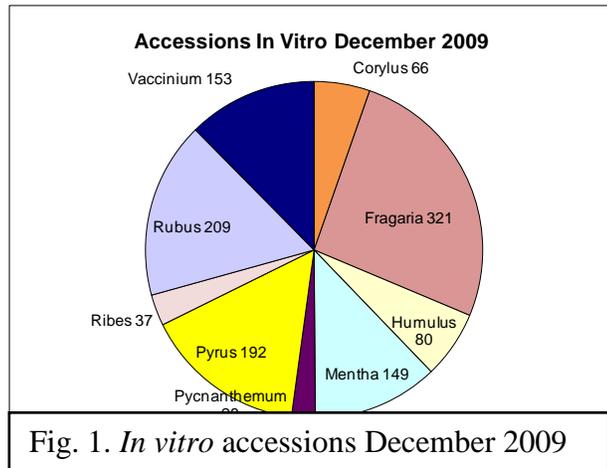


Fig. 1. *In vitro* accessions December 2009

### Medium Optimization for Pyrus

Barbara Reed, Jeanine DeNoma and Sugae Wada are continuing the large-scale medium optimization experiments initiated with a grant from the Oregon Association of Nurseries and the Oregon Department of Agriculture.

**Objective:** Determine the effect of mineral nutrition on plant appearance, shoot initiation, and elongation of pear. Shoot multiplication, shoot height, overall quality, shoot tip necrosis, callus, number of nodes, leaf necrosis, leaf size, physiological abnormalities, and chlorophyll content were evaluated to determine the best mineral salts for growth of a diversity of pear genotypes. Pears tested included two very slow growing genotypes (*P. dimorphophylla*, *P. ussuriensis* ‘Hang Pa Li’) and three moderately growing genotypes (*P. communis* ‘Winter Nelis’, ‘OH x F 87’ (Daytor) and ‘Horner 51’).

**Conclusions:** From the initial medium test we identified several “test media” that improved the growth of most of the cultivars. One of these was chosen as an interim medium for use with our “difficult to grow” accessions and greatly improved the growth and development of 20 genotypes. We continued the study with 10 genotypes and the most influential factors. From these responses we determined that the “mesos” group (Ca-Mg-Cl-Mn-SO<sub>4</sub>-PO<sub>4</sub>) was the most influential for pear growth. All 10 genotypes responded to increased concentrations of the mesos group (1 to 2.5 X the MS medium concentrations) (Fig. 2). Nitrogen concentrations and ratios will be tested next. We also have a test under way to determine how these changes affect cold storage of pear cultures.

**Impact:** Increases in the “mesos” concentrations to 1.5 or 2 X the MS concentrations greatly improved the growth of 17 accessions that were previously very difficult to grow. We are now applying this formulation to additional hard to grow accessions.



Fig. 2. Growth of 'Bartlett' pear on normal (1X) and high (2 X and 2.5 X) "mesos" treatments.

**Corylus Culture.** With funding from the Oregon Hazelnut Commission we are beginning a study to improve *Corylus* *in vitro* culture and eliminate bacterial contaminants. This study involves advanced selections from the OSU breeding program as well as named cultivars.

**Cryopreservation of shoot tips.** Esther Uchendu (OSU Department of Horticulture) completed her Ph.D. in August. Dr. Uchendu compared techniques for mint and blueberry and studied the effects of antioxidants added during the cryopreservation protocols.

The first study was designed to determine the response of diverse mint genotypes to three commonly used cryopreservation techniques. Four mints were cryopreserved using the three standard protocols: controlled rate cooling (CC), encapsulation dehydration (ED) and PVS2 vitrification (VIT). Regrowth of the four mint species following controlled rate cooling (93%) was better than encapsulation dehydration (71%) and vitrification (73%). *Mentha x piperita* nothosubsp. *citrata* and *M. australis* responded better with CC > VIT > ED. There were also significant differences in the recovery of *M. cunninghamii* and *M. canadensis*, with CC and ED > VIT. Regrowth of the shoot tips of these mints ranged from 60% to 95% for all but one treatment. These improved results may be due to a combination of favorable growth conditions, cold acclimation and recovery medium. Controlled rate cooling was the most successful technique for the storage of these diverse mint genotypes; however recovery of shoot tips from VIT and ED was high enough that these techniques could also be used for cryogenic storage of mint germplasm.

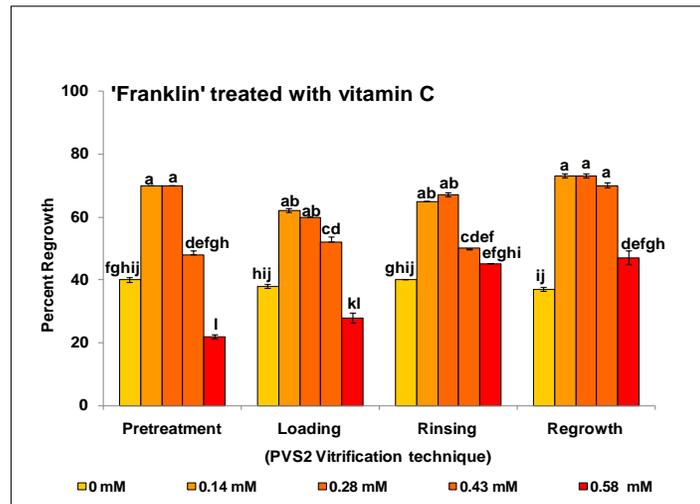
The second study screened *Vaccinium* accessions with the same three cryopreservation protocols. There was no established protocol available for *Vaccinium*. *In-vitro* grown shoot tips of two cranberry (*Vaccinium macrocarpon*) cultivars, Wilcox and Franklin and three blueberry (*Vaccinium corymbosum*) cultivars, Berkeley, O'Neal and Brigitta were tested. Initial screening for recovery followed two weeks of alternating-temperature cold acclimation. The three blueberry cultivars had 83 to 92% regrowth with the encapsulation-dehydration technique (ED) and were very tolerant of drying. The PVS2-vitrification (VIT) and controlled rate cooling (CC) varied in success depending on the cultivar and ranged from 33% to 87% for VIT and 50 to 67% for CC. The cranberry cultivars had poor (5 to 37%) recovery with all three techniques and were not tolerant to drying. The blueberry cultivars were successfully cryopreserved using all of the techniques while the cranberry cultivars require further testing to improve their response to cryopreservation.

For the third study, we hypothesized that cryopreservation induces oxidative stress; adding antioxidants would counteract the oxidation increase regrowth of shoot tips. Antioxidants were added at four critical steps of the PVS2 vitrification protocol: pretreatment, loading, rinsing, and regrowth. Vitamin E (Vit E),

vitamin C (Vit C), polyvinylpyrrolidone (PVP), glutathione (GSH), lipoic acid (LA) and glycine betaine (GB) were tested over a range of concentrations. To determine the amount of oxidation taking place at each step we assayed a lipid peroxidation product, malondialdehyde (MDA). It was present in higher concentrations at each step compared to fresh untreated shoot tips. Adding Vit E at each step resulted in the same low MDA concentrations as the control shoot tips. Shoot tip regrowth of both blackberry cultivars increased from ~45% for standard PVS2 vitrification to 92% with AA treatments. Increases in regrowth were highest with Vit C, however all except PVP improved regrowth by 25 to 30%. Adding antioxidants protected *in vitro* cultures from oxidative stress during cryopreservation. We recommend adding Vit C (0.28 mM) to the pretreatment or loading stage for improved regrowth after cryopreservation.

As a follow up to this study we tested the effect of Vit C on ‘Franklin’ cranberry cryopreserved with PVS2 vitrification. The same excellent results seen with the *Rubus* shoot tips was also apparent with ‘Franklin’. Recovery increased from 40% to 70% with the optimum Vit C treatment (Fig. 3). These results validate the earlier study confirming that antioxidants, and especially Vit C, are very effective in improving regrowth following cryopreservation.

Fig. 3. Regrowth of cryopreserved tips of cranberry cultivar Franklin 6 after rewarming. Treatments are with without vitamin C at pretreatment, loading, rinsing, or regrowth steps. with the same letter are not significantly different,  $P \leq 0.05$  (n=60).



shoot-weeks and

Means

*Rubus*

### Seed Program

Sugae Wada (OSU Department of Horticulture) completed her Ph.D. in August. Her studies included work with blackberry cultivars and with diverse species. Dr. Wada’s studies provide a wealth of new information on the structure and germination of the diverse *Rubus* seed held in the NCGR collections.

The first study on seed coat structure using scanning electron microscopy showed many taxonomic characteristics for the diverse NCGR *Rubus* collection. We examined ultrastructural morphology of 38 accessions representing 10 of the 12 *Rubus* subgenera. The results showed consistent characteristics particularly in sculpture pattern on the seed coat among groups at the subgenus level. These *Rubus* seed coat surface characteristics revealed by SEM may also provide useful information for taxonomic studies.

Seed coat structure of 17 commercial blackberry cultivars was also studied. The objective of this study was to develop a simple and effective method to distinguish blackberry cultivars using seed morphology. Seeds were examined with a dissecting light microscope and scanning electron microscopy. The 17 cultivars could be differentiated by seed shape, size, color and seed-coat sculpturing (Fig. 4). Cultivars originating from the same parents or the same maternal line could be distinguished as well. Based on this research, a handbook was designed to aid blackberry processors in determining the cultivar identity of blackberry fruit. The ability to correctly identify commercial cultivars is important to the berry industry because less desirable cultivars may be mistaken or substituted for more desirable ones, resulting in mislabeled products or economic losses. A key was designed for determining the cultivar identity based on seed characters. The initial key characteristic is the shape of the raphe: straight, concave or convex. Seed shape, size, color and seed-coat sculpturing further distinguish the cultivars. Numerous photographs and a dichotomous key aid identification. This handbook will be an online Oregon State University extension publication.

Germination of *Rubus* seed is often erratic because many species exhibit a deep double dormancy. Germination studies were performed to determine protocols for both fresh and stored *Rubus* seeds in 7 of the 12 *Rubus* subgenera. Fresh seed germinated for only a few of the 23 species tested. Sulfuric acid and sodium hypochlorite scarification treatments were followed by germination pretreatments of deionized

Fig. 4. Diversity of seed size, shape and color of 17 commercial blackberry cultivars

water (DI), gibberellic acid (GA<sub>3</sub>), potassium nitrate (KNO<sub>3</sub>) + GA<sub>3</sub>, or smoke gas. Seed coat thickness varied from 73 μm to 247 μm, so appropriate scarification was very important for *Rubus* seed germination. *Rubus* species exhibited a high negative correlation between germination and seed coat thickness. Seeds germinated best when sulfuric acid scarification was followed by a germination treatment of KNO<sub>3</sub>+GA<sub>3</sub> or smoke gas. Seed of 16 species stored at -20°C for 1 to 26 yr were also studied. Seed age did not correlate with germination. A unique hilar-end-hole was noted on two species and both germinated well in all treatments including unscarified seed (*R. odoratus* 72%; *R. parviflorus* 43%). Harder seeds had high proanthocyanidin (PA) content and required longer

scarification than species with low PA content. Seed coat anatomy, thickness, and hardness were key factors in germination of these diverse *Rubus* species.

## Molecular Genetics

By Nahla V. Bassil

Graduate Students

Wambui Njuguna, PhD student in Horticulture at OSU is wrapping up work on using molecular markers to answer different questions in *Fragaria*. A reduced fingerprinting set of 4 SSRs was developed and generated unique SSR fingerprints for over 175 *Fragaria* samples representing 22 *Fragaria* species used in the study. Testing of two molecular markers linked to the red stele and anthracnose resistances identified potential sources of resistance in previously untested genotypes. Further characterization of

these accessions is warranted to validate resistance and usefulness in breeding. SSR-based genetic diversity evaluation of *F. nipponica* and *F. iinumae* collected in Hokaido, Japan (collaboration with Kim Hummer and Tom Davis) grouped them into 10 diversity clusters and they will be preserved as such. Barcoding was not successful for species identification in *Fragaria*. Higher diversity was obtained when using universal chloroplast SSRs but homoplasmy was also detected. Sequencing whole chloroplast genomes using Illumina in a final study revealed a close maternal genome relationship between *F. vesca* ssp. *bracteata* and the octoploid species and the polyphyly of *F. vesca*. Calculation of divergence time of *Fragaria* revealed young evolutionary age of the genus at 2.7 million years, and of the octoploids at 450,000 years.

In collaboration with Chad Finn, PhD student Michael Dossett has tested transferability of *Rubus* SSR primer pairs into black raspberry. Amplification and optimum annealing temperatures of 112 *Rubus* SSR primer pairs were determined in the black raspberry ‘Munger’ by gradient polymerase chain reaction. A panel of 15 cultivars and wild black raspberry accessions was used to evaluate these SSR primers for polymorphism, using 3% agarose gel electrophoresis. This led to the identification of 27 primer pairs that appeared to generate polymorphic markers. Marker quality and genetic relationships were evaluated by fragment analysis in 12 cultivated and 4 wild genotypes using 20 of these markers after separation by capillary electrophoresis. We have also used HRM to identify SNPs in monomorphic PCR products generated with SSR primer pairs in parents of a black raspberry mapping population. HRM of PCR amplicons, using these same primer pairs, was then used to genotype seedlings in this mapping population. The observed markers segregated in a Mendelian fashion based on the genotypes of the parent plants.

#### *Projects in Progress 2009*

##### **Genetic diversity of *Corylus* species using trinucleotide microsatellites and universal cpSSR**

**markers.** We are using 15 trinucleotide SSR markers to fingerprint 169 *Corylus* accessions including five shrub species (*C. avellana*, *C. americana*, *C. cornuta*, *C. heterophylla*, and *C. sieboldiana*), and five hazelnut tree species (*C. colurna*, *C. jacquemontii*, *C. chinensis*, *C. ferox* and *C. papyraceae*). Data was collected using both marker data sets and alleles generated with the cpSSR primer pairs are being sequenced to assess homoplasmy. Data will be analyzed shortly.

**Genetic fingerprinting of the pear core collection.** We are using multiplex PCR (Type-it Microsatellite PCR Kit™ (Qiagen, Valencia, CA) (catalogue # 206243) for fingerprinting the entire core collection using a universal fingerprinting set developed by the ECPGR. Comparison of the fingerprints of the eight reference accessions obtained from East Malling Research (EMR) to those maintained at the NCGR generated different profiles for ‘Hosui’. Kate Evans (apple breeder, WSU) identified the EMR ‘Hosui’ as ‘Shinsui’. We plan to finish fingerprinting the pear collection in Spring 2010.

**Genetic fingerprinting of quince.** We evaluated 24 apple SSR primer pairs that amplify in pear for cross-transference in 45 diverse quince accessions from the Corvallis collection. Twelve out of 24 of these SSRs appeared polymorphic in quince after separation by 3% agarose gel electrophoresis. Nine polymorphic SSR primer pairs distinguished most of the 86 NCGR quince accessions, 2 clones growing in the Azores collection and 3 intergeneric *P. veitchii* hybrids. However, additional markers are needed to distinguish among closely related accessions that had identical fingerprints but that we believe are different.

**Fingerprinting of ohelo berries.** SSRs from *Vaccinium corymbosum* that are transferable to the *Myrtillus* section were identified and were used to identify three Ohelo berry clones from Hawaii and to recommend SSRs for population analysis in the .

**Developing genomic tools for blueberry.** As part of an SCRI grant led by Jeannie Rowland, we have synthesized 453 SSR primer pairs from EST sequences in blueberry and are screening them for polymorphism in parents of a tetraploid blueberry mapping population ('Draper' x 'Jewel'), diploid blueberry mapping population [(Fla4B x W8520) x W85-23], and cranberry mapping population ('Stevens' x 88-70). Polymorphic SSRs are shared with collaborators for constructing linkage maps in each of these crops. We have also generated short read sequences using the Illumina Genomic Analyzer for each of the blueberry mapping parents and will be developing SNPs for use in mapping.

**RosBREED: Enabling marker-assisted breeding in Rosaceae.** As leader of the genotyping team in an SCRI grant led by Amy Iezzoni (MSU), we are developing high throughput SNP genotyping platforms for genome-wide scanning in apple, peach, cherry and strawberry.

### **Screenhouse/Greenhouse Collection**

by Jim Oliphant and Missy Fix

- Establishment of modified climate zones to accommodate accessions originating in montane, high latitude, and subtropical regions (up to 20% of collections).
- Continued sanitation throughout facilities with an emphasis on weed control, in plant containers, floors inside the houses, and a wide buffer zone outside the houses.

### ***ACTINIDIA***

*Actinidia* is maintained in the screenhouse, as a back-up collection; at a minimum the accessions are housed for 3 years until the field plants are established. Currently, we have 37 backup accessions, there were no new accessions added in 2008. Nine accessions were identified as Non-hardy, within this group five are identified as 'Tropical' and are housed in greenhouse 1 which provides the climate needed for these plants. The remaining four accessions were placed in greenhouse 3 which houses non-hardy genera.

### ***CORYLUS***

Temporary back-up trees of all new young field trees and virused clones of *Corylus* are maintained under screen. Before a new accession can be planted in the field it must be grafted and layered until the scion is on its own roots. Scion wood of core clones is also grafted and maintained in a greenhouse as needed for tissue culture source material. Currently, 90 accessions are being maintained for tissue culture.

### ***FRAGARIA***

All clonal accessions of *Fragaria* are maintained under screen. An additional backup set of Supercore is maintained in the greenhouse. We are continuing our 3-year re-propagation cycle using runners.

### ***HUMULUS***

All clonal accessions of *Humulus* are maintained in the screenhouse.

### ***MENTHA***

All clonal accessions of *Mentha* were maintained under screen, with a 3-year re-propagation cycle via cuttings. This collection was transferred to ASPGRU. The backup collection was relocated to an outside growing area until these accessions are established at ASPGRU.

### **PYRUS**

Permanent back-up trees of all non-hardy clones, virus infected clones, and temporary back-up trees of all new young field trees of *Pyrus* are maintained under screen.

### **RIBES**

All core or non-hardy clonal accessions of *Ribes* are maintained in a tube house or under greenhouse. To date, 380 accessions are maintained as part of the permanent collection in tube house, of these 229 core accessions are established in the tube house and another 144 have been identified as non-cold hardy; these non-cold hardy are housed permanently in greenhouses. 45 finished *Ribes* were either introduced to the permanent tube house as new accessions or as replacement plants. 17 accessions remain in quarantine awaiting virus testing. Now that the *Ribes* collection has been turned over to the ASPGRU facility, propagating for in-house replaces is no longer required. Re-propagated accessions will now be turned over for field replacement as needed.

In late 2009, 111 *Ribes* cuttings were shipped for establishment at the ASPGRU facility. An additional 44 accession cuttings from Heat Treated Backup and In House Quarantine were sent in early 2010 for establishment. The *Ribes* collection will be maintained in our tube house until permanent plants have been established at the ASPGRU facility.

### **RUBUS**

All clonal accessions of *Rubus* are maintained under screen. Accessions from tropical, subtropical, and high latitude habitats are maintained in the greenhouse of which there are now 213 accessions. In 2009 19 new or replacement accessions were made ready for placement in the collection bringing the total number of accessions to 858 of which 267 are core accessions. 112 accessions that had a screen house date of four years or older were collected and re-propagated; of these 99 were successful. Regarding the *Rubus* of Concern, 11 of the remaining accessions are in this group, continued efforts are made to find workable propagation for these accessions. In the *Rubus* collection there are 74 accessions, (which include 22 new accessions), represented by one plant; 26 of these were successfully re-propagated this year and will be placed in collection in the spring or fall of 2010. There is a continued effort to re-propagate the remaining accessions in this group. *Rubus* accessions having a re-propagation date four years or older will be placed in 3 gallon containers with new soil as their re-pros progress, which should encourage growth vigor.

### **VACCINIUM**

Due to blueberry shock virus and *Phytophthora ramorum* concerns, we have established the primary collection in the screenhouse. We are growing vigorous stock plants to provide hard cutting material for distribution. We maintain under screen all core, named cultivars, and non-hardy clonal blueberry, as well as, all prostrate accessions, including lingonberry and cranberry. Additionally, we are maintaining 118 montane or non-hardy accessions in the greenhouse. All 250 core accessions have a plant under screen.

**Clonal Accessions maintained in the Greenhouses and Screenhouses as of April 2009**

	Total # Accessions	Core		Available		Single Plants With No Back-Up	
		# Ac.	%	# Ac.	%	# Ac.	%
<i>Actinidia</i>	72	10	14	58	81	8	11
<i>Corylus</i>	119	33	28	76	64	33	28
<i>Fragaria</i>	1496	554	37	1412	94	784	52
<i>Humulus</i>	385	169	44	362	94	132	34
<i>Mentha</i>	455	51	11	447	98	303	67
<i>Pycnanthemum</i>	34	18	53	34	100	0	0
<i>Pyrus</i>	341	21	6	222	65	113	33
<i>Ribes</i>	449	227	51	375	84	72	16
<i>Rubus</i>	891	275	31	793	89	66	7
<i>Vaccinium</i>	669	248	37	595	89	133	20
<b>Other<sup>2</sup></b>	134	48	36	72	54	37	28
<b>Total</b>	<b>5045</b>	<b>1654</b>	<b>33</b>	<b>4446</b>	<b>88</b>	<b>1681</b>	<b>33</b>

JMO 03-30-10

1) includes: ASI, CYD, GAY, GAU, MES, SAM, SOR, and OTHINV

## Quarantined Plants

At this time we have 173 accessions in quarantine.

### Status of Quarantined Accessions at the Repository

Genus	Federal	State	In-House
<i>Corylus</i>	2 Post-Entry		2 NCGR
<i>Cydonia</i>	11 Provisional Release		
<i>Fragaria</i>	22 Departmental Permit		
<i>Humulus</i>		20 Directors Exemption (seed)	
<i>Pyrus</i>	50 Provisional Release		
<i>Ribes</i>	1 Post-Entry	17 Directors Exemption	30 NCGR
<i>Rubus</i>	6 Post-Entry		
<i>Vaccinium</i>	2 Post-Entry		
<b>Total</b>	104	37	32

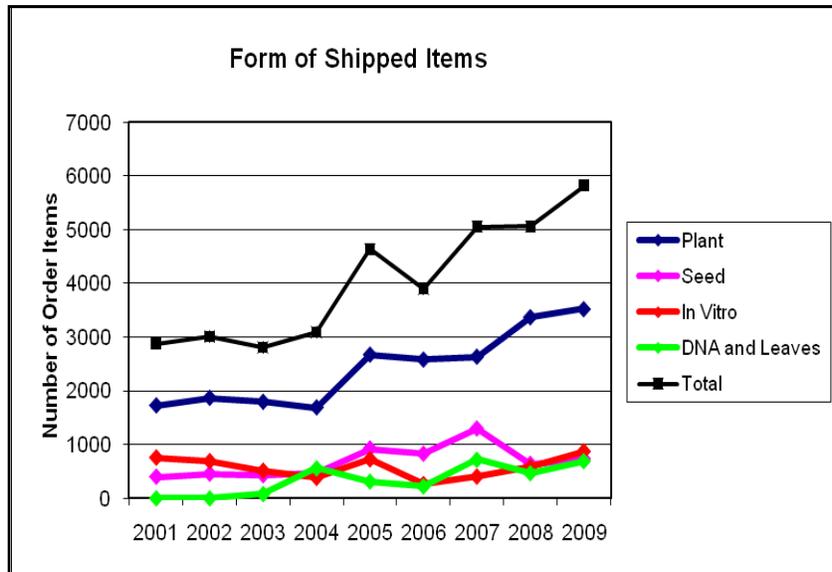
## Plant Distribution

Kim Hummer and Bruce Bartlett

“2009 Highlights”

- 5,822 items were shipped as seeds, cuttings, runners, scionwood, rooted plants, tissue culture and DNA. Once again this is a record for number of accessions sent.
- 62% of accessions requested in 2009 have been shipped.
- 11% of all items shipped were sent to foreign requestors to 20 countries
- Requests for DNA samples of our accessions, in the form of DNA and lyophilized leaves, were 698 or 11% of the total number of accessions shipped.
- Hard Cuttings (19%) Scionwood (17%), In vitro (15%), DNA (extracted and lyophilized leaves) (12%), Seed (12%) were the top forms sent.

The NCGR-Corvallis continues to distribute plant germplasm within the United States and at the international level. This report summarizes all items shipped in CY 2009, which includes accessions requested in 2006 up to and including 2009. At the time of this printing, we have distributed 5,822 items as seeds, cuttings, runners, scionwood, rooted plants, tissue culture and DNA in 2009. This represents 62% of the total number of items requested for 2009. Additional material will be shipped in CY 2010. An average of the total number of items shipped over the last seven years show that we ship about 90% of the total number of items requested from any given year.

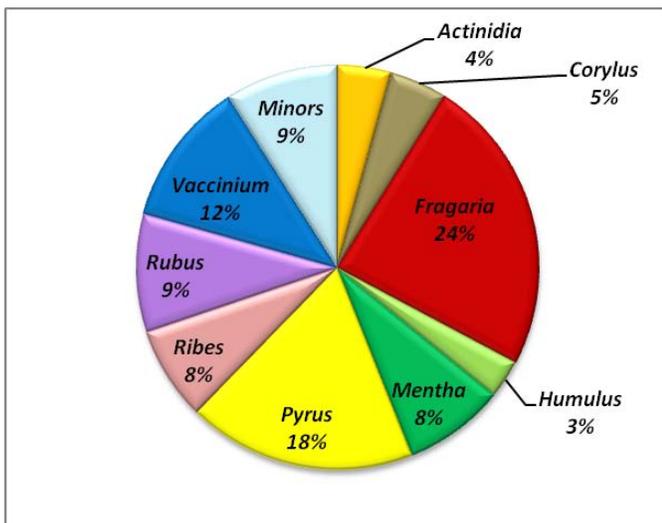


CY 2009 saw an increase in the total number of items shipped to an all time high of 5,822. This total is about 800 more than the amount shipped in 2008. Plants, scionwood/hardwood cuttings, in vitro cultures, and DNA (leaves) were predominant categories of material sent.

Material requested in a given year may require more than one year before the item is eventually shipped. This is because we have very diverse holdings and are a clonal facility. At times plant material needs to be propagated from our mother plants in order to have items in a form that is sufficiently large for shipping. However, an average of 91% of items requested will be shipped within two years of the original request.

Plants items of *Fragaria* *Pyrus*, *Vaccinium* and were sent the most. When all plant items from minor genera are considered collectively the group represents 13% of all items shipped. Continued interest in Hardy Kiwi Fruit (*Actinidia arguta*) accounted for 37% of all minor genera sent.

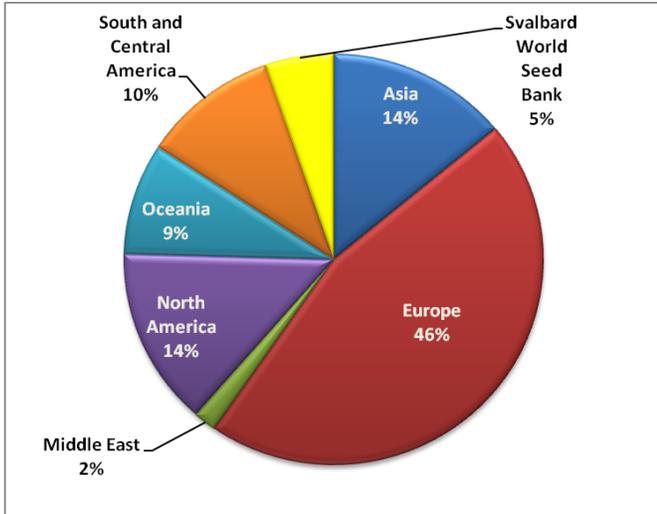
### 2009 Distribution by Genus



Our largest distributions were in *Fragaria* and *Pyrus* in 2009. *Vaccinium* has recently become of interest to many requestors. *Actinidia* (the hardy kiwifruit) has now broken out of the minor category and has become a genus with major distribution activity.

We are in the process of testing our strawberry, raspberry and blackberry accessions for additional viruses, phytoplasmas, and viroids. New rules for many countries ask that these plants be tested for additional pathogens. We are in the process of having these tests performed to allow our plant material to meet certification requirements when we can.

*Pyrus* shipments to the EU continue to be limited to seed and tissue culture since scionwood is prohibited due to fire blight (*Erwinia amylovora*). Japan, South Korea, and China are not as restrictive and therefore reflect the high numbers of *Rubus*, *Fragaria* and *Pyrus* still being sent internationally.



### 2009 Non-US Plant Distribution

During CY 2009 we shipped plant accessions to twenty one countries including the United States.

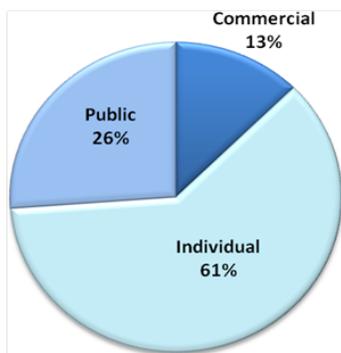
By region, 90% of the material was sent to North American destinations. But relative to only the foreign distribution, most went to Europe including Austria, Belgium, France, Germany, Italy, The Netherlands, Slovenia and Sweden. Asian distribution went to India, Japan and South Korea. Items were sent to New Zealand representing Oceania. South and Central American distribution was up this year over previous years (to 10% of foreign requests).

Those organizations or individuals receiving plant material are identified by the codes established by the Germplasm Resources Information Network (GRIN). These GRIN codes can be condensed into three user groups (Public, Commercial and Individual). Domestically the Public group represents state agencies, universities (public or private), the Agricultural Research Service of USDA, other Federal agencies, and non-profit or other public organizations (botanic gardens, arboretums, societies, centers, institutes). Internationally the Public group represents similar organizations of foreign origin. The Individual group presents persons with no affiliation and the Commercial group represents commercial companies domestic and international. The most significant change in user groups from 2006 to 2008 was the increase in shipments to individuals domestically from 36% in 2006 to 42% in 2008.

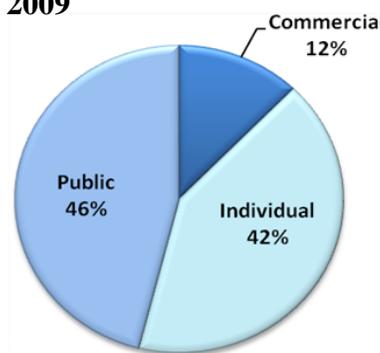
This effect is even greater between 2008 and 2009. The NCGR-Corvallis has seen an even **larger increase in requests by individuals** compared to public researchers while the commercial requests have held steady. This must be attributed to the ‘shopping-cart’ option on our national GRIN web site and access by the public.

### Distribution by User Group

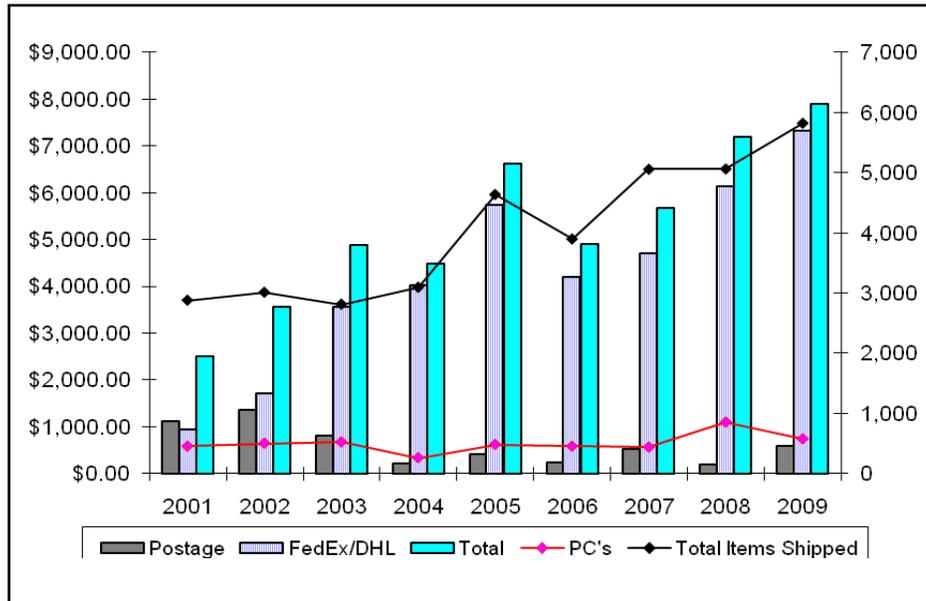
2008



2009



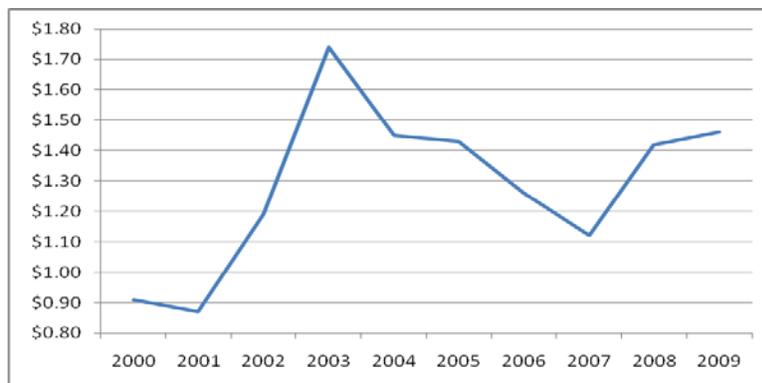
## Shipping Costs for Distribution from 2001 to 2009



The total postage paid for domestic and international shipping was \$584.07. The total cost for Federal Express/DHL was \$7322.02 and the total paid to the Oregon Department of Agriculture for 58 Phytosanitary Certificates was \$573.00. The total cost of shipping plant material in CY 2009 was \$8,479.09. This total is the most spent on any distribution year to date. The repository has begun asking requestors to pay costs of private courier, or the total cost would be higher. The Oregon Department of Agriculture also increased the cost of writing Phytosanitary Certificates from \$15.00 to \$18.00 in January 2010. The arrangements for the certificates are now made on-line. The cost of the phytosanitary certificates in Oregon is much less than other US states due to a state subsidy for the very active Oregon nursery association groups.

## Shipping Cost per Item

We have continued to maintain a very low shipping cost per item (\$1.46) on average during 2009.



## Publications Submitted in 2009

### Journal Articles and Websites

- Bassil, Nahla, Bunch, Ted, Nyberg, April, Zee, Francis, Hummer, Kim.** 2009. Microsatellite Markers Distinguish Hawaiian Ohelo from Other *Vaccinium* L. Section *Myrtillus* Species.
- Bassil, Nahla,** Muminova, Magfrat, Njuguna, Wambui. 2009. Microsatellite-Based Fingerprinting of Western Blackberries from Plants, IQF Berries and Puree. 2009.
- Bassil, Nahla, Postman, Joseph.** 2009. Identification of European and Asian Pears Using EST-SSRs From *Pyrus*.
- Dossett, Micahel, **Bassil, Nahla, Lewers, Kimberly, Finn, Chad.** 2009. Transferability of *Rubus* Microsatellite Markers for use in Black Raspberry. [Abstract]
- Dossett, Micahel, **Bassil, Nahla, Finn, Chad.** 2009. Transferability of *Rubus* Microsatellite Markers to Black Raspberry. 2009.
- Njuguna, Wambui, **Hummer, Kim, Bassil, Nahla.** 2009. DNA Barcoding in *Fragaria* L. (Strawberry) Species [Abstract]. *HortScience*. 44(4):1090.
- Reed, Barbara,** Castillo, N.R., Wada, Sugae, **Bassil, Nahla.** 2009. Transitory Polymorphisms are Observed in Cryopreserved *Rubus* Shoot Tips Using AFLP Markers. [Abstract]
- Reed, Barbara,** Castillo, N.R., Wada, Sugae, **Bassil, Nahla.** 2009. Genetic Stability of Cryopreserved Shoot Tips of *Rubus* Germplasm.
- Njuguna, Wambui, Liston, Aaron, Cronn, Rich, **Bassil, Nahla.** 2009. Multiplexed *Fragaria* Chloroplast Genome Sequencing.
- Hummer, Kim,** Davis, Tom, Njuguna, Wambui, **Bassil, Nahla,** Nathewet, Preeda, Yanagi, Tomohiro. 2009. Decaploidy in Oregon *Fragaria virginiana* subsp. *Platypetala* (Rosaceae).
- Njuguna, Wambui, **Hummer, Kim,** Richards, Christopher, Davis, Thomas, **Bassil, Nahla.** 2009. Genetic Diversity of Diploid Japanese Strawberry Species Based on Microsatellite Markers.
- Castillo, Nina, **Reed, Barbara,** Graham, Julie, Fernandez-Fernandez, Fel, **Bassil, Nahla.** 2009. Microsatellite Markers for Raspberries, Blackberries, and their Hybrids.
- Slovin, Janet, Shulaey, Vladimir, Folta, Kevin, Davis, Thomas, Sargent, Daniel, **Bassil, Nahla,** Folkerts, Otto. 2009. A Genome Enabled Reference Species for Fruit Development; The Diploid Strawberry, *Fragaria vesca*. [Abstract]
- Hummer, Kim.** 2009. *Rubus* Pharmacology: Antiquity to the Present. [Abstract] *HortScience*. 44(4):985.
- Hummer, Kim.** 2009. Proceedings of the Ninth International *Vaccinium* Symposium Vol 1.
- Hummer, Kim.** 2009. Proceedings of the Ninth International *Vaccinium* Symposium Vol. 2. Lueven, Belgium. *International Society of Horticultural Science Proceedings*. 810(2):439-909.
- Hummer, Kim.** 2009. International Regulations Regarding Exchange of *Rubus* Plant Material.
- Hummer, Kim,** Dale, Adam. 2009. Horticulture of *Ribes*. *Forest Pathology*
- Hummer, Kim,** Davis, Tom, Njuguna, Wambui, **Bassil, Nahla,** Nathewet, Preeda, Yanagi, Tomohiro. 2009. Decaploidy in Oregon *Fragaria virginiana* subsp. *Platypetala* (Rosaceae).
- Hummer, Kim.** 2009. Maxine M. Thompson – Dedication.
- Njuguna, Wambui, **Hummer, K.E., Bassil, N. V.** 2009. DNA Barcoding in *Fragaria* L. (Strawberry) Species. [Abstract] *HortScience*. 44(4):1090.
- Hall, H., **Hummer, K.E.,** Jaimieson, A., Jennings, S., Weber, C. 2009 *Plant Breeding Reviews: Raspberry Breeding and Genetics*. New Jersey: Wiley Blackwell. 32:39-382.
- Nathewet, Preeda, **Hummer, K.E.,** Iwatsubo, Yoshikane, Sone, Kazuyoshi, Yanagi, Tomohiro. 2009. Karyotype Analysis in Octoploid and Decaploid Wild Strawberries, *Fragaria* (Rosaceae).
- Dalton, Danny, **Hummer, K.E.** 2009. Inheritance of the Cr Gene in *Ribes nigrum*.

- Dalton, Danny, **Hummer, K.E.** 2009. Ribes Bloom Phenology: Section Botrycarpum and Ribes.
- Njuguna, Wambui, **Hummer, K.E.**, Richards, Christopher, Davis, Thomas, **Bassil, Nahla.** 2009. Genetic Diversity of Diploid Japanese Strawberry Species Based on Microsatellite Markers.
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- Dalton, Danny, Postman, Joseph, Hummer, Kim E. 2009. Comparative Infectivity of *Cronartium ribicola* Aeciospores and Urediniospores on *Ribes nigrum*.
- Bassil, Nahla V., Bunch, Theodore, Nyberg, April, Zee, Francis, Hummer, Kim E.** 2009 Microsatellite Markers Distinguish Hawaiian Ohelo from Other *Vaccinium* L. Section *Myrtillus* Species.
- Cyr, Peter, Weaver, B., Millar, Mark, Gardner, Candice, Bohning, Mark, Emberland, Gorm, Sinnott, Quinn, Kinard, Gary, **Postman, Joseph, Hummer, Kim**, Franco, T., Mackay, M., Guarino, L., Bretting, Peter. 2009. GRIN-Global: An International Project to Develop a Global Plant Genebank and Information Management System [Abstract].
- Postman, Joseph.** 2009. *Cydonia oblong*: The Unappreciated Quince. *Arnoldia.* 67(1): 2-9.
- Postman, Joseph,** Aldwinckle, H., Volk, G.M. 2009. Standardized Plant Disease Evaluations will Enhance Resistance Gene Discovery. Meeting Proceedings. *HortScience.* 44:975.
- Postman, Joseph,** Stockwell, Virginia. 2009. Relative Susceptibility of Quince, Pear, and Apple Cultivars to Fire Blight Following Greenhouse Inoculation.
- Postman, Joseph,** Bobev, Svetoslav. 2009. Field Susceptibility of Quince Hybrids to Fire Blight in Bulgaria.
- Hummer, Kim, Postman, Joseph.** 2008. *Pyrus* L. Pear. Bonner, F.T. and Karrfalt, R.P., editors. The Woody Plant Seed Manual. Washington, D.C.: United States Government Printing Office. P. 922-927.
- Jenderek, Maria, **Postman, Joseph,** Stover, Eddie, Ellis, David. 2009. Desiccation Studies of Dormant Buds from Selected Woody Horticultural Plant Species.

### Some “Unappreciated” Fruits

