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## Minutes

### NRSP6 Technical Advisory Committee meeting 2016

June 14, Fort Collins, CO

The meeting was hosted by the US Potato Genebank at the joint 5-year RTAC, PGOCC & NPGCC Meetings.

#### Tuesday, June 14th

Attending - Genebank personnel: M. Martin, J. Bamberg. Tech Reps: R. Novy, D. Douches, D. Holm, W. De Jong. Administrative Advisors: None. Quarantine: None. AAFC - B. Bizimungu. Industry: G. Gusmini (PepsiCo). Local scientists and miscellaneous guests: R. Hoopes (retired).

1. R. Novy called the meeting to order at 8:05 am –  
Announcements – Regional reports sent via email. All accounted for.
2. Agenda – No changes made (unanimous approval)
3. Review of 2015 Minutes – unanimously approved.
4. Chairman Novy appointed C. Yencho and W. DeJong appointed to the resolutions committee.

#### Reports and topics for discussion

5. Lead AA (Lindroth) and other regional AA's (Nessler, Ashworth, Curtis)  
R. Lindroth report –
  - Submitted to John prior to meeting. Dr. Lindroth is stepping down from Assoc. Dean and returning to faculty ranks. A new Lead Administrative Advisor of NRSP-6 will be assigned. Updates: Peninsular station next in line for possible funding reductions, dependent on future UW-system budget cuts. Genebank is located on a UW-Madison agriculture research experiment station, one of twelve such stations in the state. Effect of cuts, if any, on these research stations is currently unknown. Discussions on how NRSP-6 project will address reductions. Various options exist and what is done will depend on extent of cuts and whether or not station is closed entirely or not, what staff are retained, etc. Utility costs are the major costs. Low use of the Peninsular Station by UW scientists not helping.
  - NRSP-6 renewal approved for another 5 years. Proposal reviewed favorably. Strong support by all regions. Concerns about future level of off-the-top regional funding at \$150K. ESCOP unanimously recommended it be approved, with additional recommendation that external funding be secured in the future. Alternative funding models need to be explored and should be submitted at mid-term review. Various options being pursued for cost-sharing – industry (NPC, State commodity associations, private gifts, etc.).

- G. Gusmini (dialed in mid-way in conversation) – Provided some thoughts on long-term viability models for genebank, public-private partnership opportunities. Task force needed to begin formulating thoughts on how to address. Lots of folks open to listen not sure on how many are willing to support.
- J. Bamberg – Strategy to move forward laid out – NPC, UWisc, Private industry, National program office, USDA-ARS. Significant discussions on grants, etc. ensued. No strong consensus expressed on how to proceed, but this is a recurring problem. Need to wait and discuss with next Advisor then establish committee.
- C. Yencho – Provided a brief comparison of sweetpotato and potato genebank activities. The potato genebank and its personnel are much more active and engaged than the sweetpotato genebank. He wishes this could be so for the sweetpotato genebank.

6. Regional AA Reports – None submitted.

7. Regional, USDA and Ag Canada Tech reports (Holm, Douches, DeJong, Yencho, Novy, Bizumungu) – written reports from tech reps are attached.

Highlights:

D. Holm – Submitted (see attached)

D. Douches – Submitted (see attached) – North Central 4 breeding programs active, NDSU now using *S. verneii* for *Globodera pallida* resistance and GN. Discussions on changing needs for nematode resistance. Minnesota moving forward with a new potato breeding position. MSU reemphasizing diploid breeding for self-compatibility research efforts with M6 gene – phu, chc, mic, ber, tar, tbr. On 1<sup>st</sup> backcross with materials. Starting some insect R work again with ber and chc using inbred diploids. Last yr. with CGC funding screened 150 demissum materials in fields for PLB resistance. Cooperacion 88 from CIP has gone through quarantine. Reported to have good late blight R and virus R.

W. DeJong - Submitted (see attached) – Provided some thoughts on role of local breeding programs providing materials as opposed to genebank providing materials. John followed up on this discussion. Roughly 70% for research 30% home gardener, but 94% of what is sent out goes to research or industry and affiliated community. C. Yencho - Is it time to charge a cost-recovery fee for providing materials to public as a way to address funding needs? Consensus is no, but perhaps needs to be revisited in the future as it is not a significant cost at this point.

C. Yencho - Submitted (see attached) – Dave D. recognized R. Veilleux's tremendous work over the years. With CGC funding, TAMU requested the Mini-Core collection from the US Potato Gene Bank, Sturgeon Bay, WI for evaluation of potato psyllid (*Bactericera cockerelli*) and/or *Candidatus Liberibacter solanacearum* (Lso) resistance.

R. Novy – Submitted (see attached) - Overview of research highlights covered by germplasm requests. Pest Resistance: Potato psyllid and potato cyst nematode; Enhanced Tuber Qualities: Cold-induced sweetening resistance and increased tuber calcium; Unique/Enhanced Marketability: Reduced tuber greening, exaggerated fingerling shape, and deeper yellow flesh with use of *Criolla* egg

yolk type potatoes; Nutritional Improvement: Increased Folate; Environmental tolerances: Improved salinity and heat tolerances; Novel Traits: Floral mutants, enhanced species tuberization (earlier maturing with large tubers), mineral uptake in epiphytic potato species, fatty acid profiling of potato TPS, species' hyperspectral reflectance patterns and use in taxonomic classification.

B. Bizimungu - Submitted (see attached) - Agriculture and Agrifood Canada Report – New cultivars and advanced selections released to industry for commercial evaluation virtually contain one or more wild species in their pedigrees. A major focus: resistance to major diseases and pests (including late blight, PVY, PLRV, *Verticillium* wilt, blackleg and the Colorado potato beetle); cold-induced sweetening resistance into parental lines and adapted cultivars. Example: Utilization of *S. oplocense* as a source of CPB resistance breeding. Interesting comments on heirloom varieties “Prince Albert” and “Likely”.

#### 8. Industry and Cooperator Reports –

G. Gusmini (Pepsico) – Proposal on multi-year “ploidy management system” based on micro-spores with NRC in Saskatoon pending.

#### 9. NRSP6 Project Sturgeon Bay report (Bamberg, Martin) and reports from other USDA project staff – Bamberg has already made it available online.

Some highlights:

- Annual report format. Report written for FY15 (ended Sep 30, 2015).
- Orders are up 26%
- Potential ornamental from 4x commersonii
- Diploid breeding materials from Henry DeJong imported and available. Need to get feedback from germplasm recipient on how useful the materials are to determine what to keep/drop in future.
- Colombian “Egg Yolk” Criolla research continues with taste tests
- Genetic diversity “Hot Spot” research – Several diversity dense locations found in American SW for Jamesii. Low TGA, dormancy, tuber freeze tolerance...perhaps indicators of domestication? Virus resistance present in jam.
- Jamesii as an example for determining how many populations needed to sampled to assess germplasm diversity?
- SCAN project – use of flat bed scanner for plant pictures
- Zebra chip psyllid resistance discovered in ver with Rodney Cooper ARS-Wapato.
- Freeze tolerance research of mini-core –Jamseii
- Germplasm sharing with Puno, Peru

10. NIFA (A. Thro) – Not present, no report – Gary Kinard (Res. Leader, Natl. Germplasm Resources Lab) stopped in to say hello to group and provided a quick report of national program activities. The potato genebank research stations funding question addressed earlier by the group (see item 5) was posed by R. Novy re. NRSP-6. Dr. Kinard indicated this question is best placed to Peter Bretting at national level.

11. APHIS Quarantine – Jorge Abad has moved to a new position with APHIS. No updates on pending replacement. Update on 55 Peruvian lines imported to US and request by TAC for Jorge to address. Gabe indicated emails were sent to address this issue and it has been resolved. G. Kinard - NextGen sequencing technologies becoming more relevant to quarantine issues. How this will impact future work is to be determined and it may raise interesting issues.

12. Resolutions – unanimously approved:

- Whereas Richard Lindroth, served faithfully and conscientiously as the Lead Administrative Advisor of the NRSP-6 technical advisory committee from 2010 until 2016, let it be resolved that we acknowledge Dr. Lindroth for his dedicated service and advice to the US potato genebank. His advice and good will be missed and we wish him well.
- Whereas John Bamberg, Max Martin, Jesse Schartner and other genebank staff have organized an excellent and efficient meeting, and they have provided a thorough overview of the excellent work they conduct to maintain, characterize and disseminate germplasm resources for the benefit of scientists in the USA, Canada, and around the world, let it be resolved that the genebank staff be commended in the highest possible terms for their hospitality and scientific contributions to the potato community.
- Whereas, this meeting was held in conjunction with the 2016 Joint National Germplasm System Meeting, we would like to recognize the support of Dr. Stefanie Green, Mr. Harvey Blackburn and the Fort Collins USDA-ARS plant germplasm group for assisting with the organizational and logistical support of this meeting.

13. Election of New Officers and Venue for 2017 –

New TAC officers for 2017:

Gusmini = Secretary

Yencho = Vice Chair

DeJong = Chair

.

Venue for 2017: Sturgeon Bay, WI. Dates to be announced.

Meeting concluded at 11:15 Am, Wednesday June 24<sup>th</sup>.

Respectfully submitted,  
Craig Yencho, Secretary

## **NRSP-6 TAC16**

### **Meeting Schedule**

Ft. Collins, CO

(joint 5-year RTAC, PGOCC & NPGCC)

**MONDAY, June 13th = travel day**

**TUESDAY, June 14th**

**8:00 AM: NRSP6 TAC business meeting as in bold below from provided multimeeting schedule.**

Tuesday June 14, AM- Curator Workshop I/RTAC/NPGCC meetings

Tuesday, June 14, PM- Joint PGOCC meeting

Wednesday, June 15 AM- Joint PGOCC meeting

Wednesday June 15 PM- Tour NLGRP (1:30-2:30), PGOCC meeting (3:00-5:00)

### **AGENDA**

#### **NRSP6 TAC 2016 BUSINESS MEETING**

Tuesday, June 14, 2016

Chair = Novy

Vice Chair = DeJong

Sec = Yencho

Preliminaries

1. Welcome, introductions, announcements, distribution of documents
2. Approve, add to, schedule and prioritize agenda items
3. Review of 2015 minutes
4. Chairman Novy appoints Resolutions Committee
- Reports and topics for discussion
5. Lead AA (Lindroth) and other regional AAs (Nessler, Ashworth, Curtis)
6. Regional, USDA, and Ag Canada Tech Reps (Holm, Douches, DeJong, Yencho, Novy, Bizumungu)
7. Industry and other cooperator perspectives/reports
8. NRSP6 Project Sturgeon Bay report (Bamberg, Martin) and reports from other USDA project staff
9. NIFA (Thro)
19. APHIS/Quarantine
11. Review and approve resolutions
- 12 Elect new officers and set next meeting venue

# NRSP-6 TAC16

## Meeting Schedule

Ft. Collins, CO  
(joint 5-year RTAC, PGOC & NPGCC)

**MONDAY, June 13<sup>th</sup> = travel day**

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**8:00 AM: NRSP6 TAC business meeting as in bold below from provided multi-meeting schedule.**

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## AGENDA

### NRSP6 TAC 2016 BUSINESS MEETING

Tuesday, June 14, 2016

Chair = Novy

Vice Chair = DeJong

Sec = Yenko

#### Preliminaries

1. Welcome, introductions, announcements, distribution of documents
2. Approve, add to, schedule and prioritize agenda items
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#### Reports and topics for discussion

5. Lead AA (Lindroth) and other regional AAs (Nessler, Ashworth, Curtis)
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## North Central Utilization of Germplasm Resources from NRSP-6

### North Dakota State University Susie Thompson

Objectives of the NDSU potato breeding program are to identify and release potato (*Solanum tuberosum* Group Tuberosum L.) cultivars adapted to North Dakota, Minnesota, and the Northern Plains, possessing superior yield, disease/pest resistance, and quality characteristics; to identify and introgress into adapted potato germplasm, resistance to major and emerging abiotic and biotic stressors, causing economic loss and limiting potato production in these areas; and to identify and develop improved germplasm with enhanced quality attributes for adoption by potato producers, industry, and consumers. We emphasize disease, insect pest, and stress resistance, including late blight, cold-sweetening, Colorado potato beetle, *Verticillium* wilt, pink rot and *Pythium* leak, sugar end, silver scurf, *Fusarium* dry rot, PVY, and aphid resistance breeding, new and emerging pests including powdery scab and potato mop top, and nutritional attributes such as antioxidants, resistant starch, and vitamin content. These priorities reflect the susceptibility of potato to numerous pests and stresses, all reducing yield and/or quality, and that limit production and marketing. In order to address producer and consumer needs and the shortcomings of current commercially acceptable cultivars, the NDSU potato improvement team uses a combination of germplasm enhancement and dedicated crossing blocks to develop resistance to abiotic and biotic stresses, and to improve quality attributes. These efforts include the continued use of wild species hybrids, including genotypes with *Solanum* species (*phureja*, *chacoense*, *etuberosum*, *berthaultii*, *raphanifolium*, and *bulbocastanum*) in their immediate pedigree. Some of this material has been created in our own program, but also has been developed in programs under the direction of Drs. Shelly Jansky (M lines, J lines of John Helgeson's her predecessor), Kathy Haynes, Rich Novy (Ebt's), and Chuck Brown (PA99N selections), all whom are active in conducting 'pre-breeding' efforts following identification of accessions with desirable traits. Some of our recent uses of NRSP germplasm resources are briefly summarized:

- Eighteen accessions (*S. cardiophyllum*, *S. jamesii*, and *S. stoloniferum*) from the Potato Introduction Project at Sturgeon Bay in 2013 to enhance our insect resistance breeding efforts. Tubers were produced from true potato seed (TPS) in the greenhouse and tubers were grown in the field in 2014. Selections which tuberized under our short day conditions are being phenotyped for insect resistance and evaluated for breeding value.
- Several *phu-sto* hybrid progeny created by Dr. Kathy Haynes have been incorporated into our program for accessing many traits, including colored flesh. A limited number have been used as parents in crossing (2015 and 2016 progeny families). Eight selections were increased in 2015, and are again in our increase block for 2016, in order allow larger trait assessment. All have unique skin and flesh color combinations; several are fingerlings or produce high yields of C-sized tubers, of interest to consumers such as restaurateurs.
- In June 2015, we accessed plantlets of PI407415 (CIP800291), a *S. vernei* derivative possessing *Globodera pallida* resistance. Sadly, my staff didn't keep them alive, so I will be requesting tubers if available this time (not everyone is good at watering seedlings or plantlets...too much or too little seems to be the norm, not a happy medium). While Golden and pale cyst nematodes are not present in our production region, we wish to make our germplasm more widely suitable for areas which may have these pests. *S. vernei* also possesses insect pest, disease, and physiological stress resistance (frost tolerance for example).



The NRSP-6 Potato Genebank and Potato Introduction Project continue to be invaluable to the NDSU potato breeding and improvement efforts NDSU and to US potato breeding efforts.

**University of Wisconsin  
Jeff Endelman**

This past year the Endelman Lab (UW-Madison) received several haploid inducer lines as tissue culture plantlets from the Potato Genebank. Our focus has been on IVP 101, which we are transplanting into the greenhouse every few months to grow plants for pollen collection. We will be making pollinations with IVP 101 in summer 2016 for the first time, with the goal of extracting dihaploids from red tetraploid varieties.

**University of Minnesota  
Tom Michaels**

Tom Michaels has taken the leadership in the potato breeding efforts at the University of Minnesota. He expects to start accessing diploid germplasm from the genebank in the future.

**Michigan State University  
David Douches**

We are refocusing our diploid breeding effort to incorporate the dominant Sli gene, which imparts self-compatibility (SC), into our diploid germplasm base. The major source of the gene is *S. chacoense* M6 from Shelley Jansky's program. Have established an accelerated recurrent selection program that has a one year cycle. We have completed four rounds of crossing and three rounds of selection for tuber shape, size, photoperiod adaptation and SC. The germplasm in this population is a combination of *S. phureja*, *S. berthaultii*, *S. tarjense*, *S. chacoense*, *S. microdontum* and *S. tuberosum*. These species have been chosen over the years because of late blight resistance, PVY resistance, beetle resistance, verticillium wilt resistance, chip-processing quality, high solids, dormancy and yellow flesh. Some of the selections are being used to develop populations for genetic studies that will be SNP genotyped. Our ultimate goal is to develop inbred diploid lines that can be used as true-breeding varieties or be parental material in F1 hybrids.

We have also have hybridized the first cycle of selections to Atlantic and Superior dihaploids. We are extracting more haploids from *S. tuberosum* varieties and advanced breeding lines and have confirmed dihaploids from NY148, Kalkaska, MSR127-2, MSS576-5SPL, MSQ131-A, MSJ147-1. We use chloroplast counts and SNP genotyping to determine ploidy of the dihaploid candidates.

We have crossed a set of *S. berthaultii* PIs that have high densities of leaf trichomes to M6, the SC source. F1s were selfed and an F2 generation was grown and selfed to generate F3s with the goal of creating a RIL population segregating for glandular trichomes. The population size is currently over 190 progeny. We are also crossed USDA8380-1 to M6 to generate F1s. The F1s were selfed and the F2 generation is being grown out the summer of 2016. We also crossed the CEC clones from NRSP-6 with M6 to introduce SC. These progeny will be grown out and assessed for SC.

We have also used the species *S. berthaultii* for developing a mapping population to conduct QTL analysis for late blight resistance, tuber dormancy and tuber number and size. The population was SNP genotyped last year. This population was in the field for field late blight data collection to complement

the detached leaf bioassay data collected in 2015. Right now we have a major late blight QTL on Chr. 10. Tuber dormancy is preliminarily mapped to Chr. 4, 5 and 7.

We have used Alca Tarma as a source of PLRV resistance. Through marker-assisted selection we have a population that contains over 90 progeny that have both markers for PVYadg and PLVR resistance. BC2 populations have been generated for selection of more adapted progeny that combine both virus resistances.

Last year we evaluated approximately 150 *S. demissum* accessions for foliar late blight resistance at the Clarksville Research Center. Most accessions were resistant. The data was sent to NRSP-6.

Ph.D. student Michael Hardigan is continuing to study some of these species with Robin Buell. A subset was chosen for sequencing. This complements the *S. tuberosum* sequencing effort of Ph.D. student Gina Pham with Robin Buell. A manuscript on this work is in preparation.

# 2015 NC ORDERS

Friday, May 06, 2016

Anschutz, Dennis

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PHONE: (920) 824-5090

FAX:

5 units shipped in 1 order/s

---

8833 Pine Lane

Brussels, Wisconsin 54204

Bao, Yong

<yong.bao@pepsico.com>

PHONE: (612) 406-0393

FAX:

1089 units shipped in 1 order/s

---

PepsiCo, Inc. - University of Minnesota

1991 Upper Buford Circle

St. Paul, Minnesota 55108

Bedewitz, Matthew

<bedewitz@msu.edu>

PHONE: (616) 307-8016

FAX:

1 units shipped in 1 order/s

---

Michigan State University

A288 Plant & Soil Sciences Building

East Lansing, Michigan 48824

Benson, Zachary

<zacmbenson@gmail.com>

PHONE: (651) 766-5292

FAX:

35 units shipped in 1 order/s

---

Seed Savers Exchange

511 South Glen Trail

Lino Lakes, Minnesota 55014

Bittner, Andy

<greenwellplantfarm@gmail.com>

PHONE: (513) 203-4927

FAX:

3 units shipped in 1 order/s

---

Greenwell Plant Farm

1980 Faywood Drive

Cincinnati, Ohio 45238

Caravati, Curzio

<seedsaver@curzio.com>

PHONE: (262) 553-1305

FAX:

11 units shipped in 3 order/s

---

Kenosha Potato Project

403 8th St.

Kenosha, Wisconsin 53140

Clasen, Benjamin

<bclasen@collectis.com>

PHONE: (651) 216-2279

FAX:

3 units shipped in 1 order/s

---

Collectis Plant Sciences

600 County Road D West

New Brighton, Minnesota 55112

Cook, Mishelle  
<panndoria@gmail.com>  
PHONE: (234) 521-7077  
FAX:

The Farm  
4592 Lucas Perrysville Road  
Perrysville, Ohio 44864

1 units shipped in 1 order/s

---

Coombs, Joseph  
<coombs@msu.edu>  
PHONE: (517) 353-3145  
FAX: 517-353-5174

Michigan State University  
Crop & Soil Science Department - A412  
East Lansing, Michigan 48824

25 units shipped in 1 order/s

---

Del Rio, Dr. Alfonso  
<adelrioc@wisc.edu>  
PHONE: (608) 262-5350  
FAX: (608) 262-4743

University of Wisconsin  
Department of Horticulture  
Madison, Wisconsin 53706

840 units shipped in 2 order/s

---

Douches, Dr. David S.  
<douchesd@msu.edu>  
PHONE: (517) 355-0271  
FAX: 517-353-5174

Michigan State University  
Department of Crop and Soil Science  
East Lansing, Michigan 48824-1325

182 units shipped in 4 order/s

---

Dzejachok, Susanna  
<sdzejachok@gmail.com>  
PHONE: (216) 926-3261  
FAX:

Kenosha Potato Project  
1154 E 172nd Street  
Cleveland, Ohio 44119

13 units shipped in 1 order/s

---

Endelman, Jeffrey  
<endelman@wisc.edu>  
PHONE: (608) 250-0754  
FAX:

University of Wisconsin - Dept of Hort  
1575 Linden Drive  
Madison, Wisconsin 53706

15 units shipped in 1 order/s

---

Greaves, Dr. John A.  
<john.greaves@kemin.com>  
PHONE: (515) 559-5100  
FAX: (515) 559-5232

Kemin Industries, INC  
2100 Maury St.  
Des Moines, Iowa 50317-1134

2469 units shipped in 15 order/s

---

Hinton, Nicole  
<mhinton5@netzero.net>  
PHONE: (573) 660-2097  
FAX:

HC 7 Box 194  
Doniphan, Missouri 63935

6 units shipped in 1 order/s

---

Hoopes, Bob  
<potato\_breeder@yahoo.com>  
PHONE: (715) 771-9966  
FAX:

3490 Spring Drive  
Rhinelander, Wisconsin 54501

2 units shipped in 1 order/s

---

Johansen, Ben  
<ben.lee.johansen@gmail.com>  
PHONE: \*\*\*\*\*  
FAX:

2380 German Road  
Baileys Harbor, Wisconsin 54202

10 units shipped in 1 order/s

---

Just, Cory  
<mr.handyman1988@yahoo.com>  
PHONE: (906) 231-7833  
FAX:

55698 Pepin Road  
Calumet, Michigan 49913

1 units shipped in 1 order/s

---

Knutson, Diane  
\*\*\*\*\*  
PHONE: \*\*\*\*\*  
FAX:

Door County Master Gardeners Associatio  
4312 State Highway 42 North  
Sturgeon Bay, Wisconsin 54235

16 units shipped in 1 order/s

---

Li, Rugang  
<rugang.li@agdia.com>  
PHONE: (574) 264-2014  
FAX:

Agdia Inc.  
52642 County Road 1  
Elkhart, Indiana 46514

4 units shipped in 1 order/s

---

Lozano, Tinita Rosa  
<tinita182@hotmail.com>  
PHONE: \*\*\*\*\*  
FAX:

2100 Como Avenue  
St. Paul, Minnesota 55108

3 units shipped in 1 order/s

---

Maronek, Carole  
maronek@aol.com  
PHONE: (920) 854-2106  
FAX:

1519 Door Bluff Road  
Ellison Bay, Wisconsin 54210

16 units shipped in 1 order/s

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Maskiell, Dianna  
<drmaskiell@hotmail.com>  
PHONE: (937) 768-1679  
FAX:

Southern State Community College  
10817 Hiawatha Drive  
Hillsboro, Ohio 45133

1 units shipped in 1 order/s

---

McColly, Fred  
<fmccolly@umail.iu.edu>  
PHONE: (219) 962-6312  
FAX:

Indiana University Northwest  
2571 Wells Street  
Lake Station, Indiana 46405

4 units shipped in 1 order/s

---

Mireles, Angel  
<angelmireles96@aol.com>  
PHONE: (219) 845-5270  
FAX:

6804 Wicker Avenue  
Hammond, Indiana 46323

1 units shipped in 1 order/s

---

Nelson, Katherine  
<kablanchard01@ymail.com>  
PHONE: (269) 357-5706  
FAX:

54120 Pine Road  
South Bend, Indiana 46628-5606

27 units shipped in 1 order/s

---

Neu, Dr. Matthew  
<mneu1@my.anokaramsey.edu>  
PHONE: (763) 260-0518  
FAX:

7393 8th St. N  
Princeton, Minnesota 55371

2 units shipped in 1 order/s

---

Petrack, Janina  
<j\_petrack@gbms.us>  
PHONE: (262) 246-1799  
FAX: (262) 246-1762

CETS Technology  
N77W24677 Century Ct.  
Sussex, Wisconsin 53089

30 units shipped in 1 order/s

---

Pine, Nicole  
<pine.nicole@yahoo.com>  
PHONE: (605) 630-8621  
FAX:

118 N Vyborny St. #4  
Tabor, South Dakota 57063

1 units shipped in 1 order/s

---

Saunders, Michael  
<avalonstonefruit@yahoo.com>  
PHONE: (608) 774-2653  
FAX:

PO Box 98  
Avalon, Wisconsin 53505

14 units shipped in 2 order/s

---

Simrell, Merle  
<mojays8@yahoo.com>  
PHONE: (417) 465-2342  
FAX:

De Somerville Farm  
12562 S. 2400 Road  
Walker, Missouri 64790

19 units shipped in 1 order/s

---

Smith, Zoey  
<morgan06cheer@yahoo.com>  
PHONE: (513) 804-6567  
FAX:

2018 Woodlawn Avenue  
Middletown, Ohio 45044

2 units shipped in 1 order/s

---

Systemann, Nick  
<nickbradlee123321@gmail.com>  
PHONE: (586) 727-3597  
FAX:

37424 Robert Dr.  
Richmond, Michigan 48062

1 units shipped in 1 order/s

---

Turner, Danny  
<turnerandsonsnursery@gmail.com>  
PHONE: (417) 357-0118  
FAX:

Turner and Son's Nursery  
1662 McCord Bend Road  
Galena, Missouri 65656

9 units shipped in 1 order/s

---

Wielgus, Susan  
<swielgus@wisc.edu>  
PHONE: (608) 262-9796  
FAX: 608-262-4743

University of Wisconsin  
Department of Horticulture  
Madison, Wisconsin 53706

2 units shipped in 1 order/s

---

Yankosky, Jeff  
<amandayy@comcast.net>  
PHONE: (734) 255-1106  
FAX:

4195 East Cedar Lake  
Chelsea, Michigan 48118

5 units shipped in 1 order/s

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Zhu, Xiaobiao  
<xzhu56@wisc.edu>  
PHONE: (608) 262-1878  
FAX:

University of Wisconsin - Madison  
Department of Horticulture - Room 421  
Madison, Wisconsin 53706

1 units shipped in 1 order/s

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\*\*\*\* = INFORMATION NOT PROVIDED BY COOPERATOR



## Report to NRSP-6 Technical Committee, June 2016

Northeast Region Representative: Walter De Jong

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The Northeast region received 265 units of germplasm, spread across 19 requests, in 2015.

Of these, 3 accessions were sent to one researcher at a land grant university while 13 units were sent to researchers at non-land grants. 105 of the accessions were sent to the Scatterseed Project ([www.gardeningplaces.com/scatterseed.htm](http://www.gardeningplaces.com/scatterseed.htm)), an independent program that seeks to preserve genetic diversity for future generations. The remaining 144 accessions were distributed to 15 individuals interested in one or more specific varieties for home gardening, small scale commercial production, or for hobby breeding.

Recipients and any comments received from them follow below.

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Algiere, Jack L.  
<jacka@stonebarnscenter.org>  
PHONE: (914) 366-6200  
FAX:  
8 units shipped in 1 order/s

Stone Barns Center for Food &  
Ag 630 Bedford Road  
Pocantico Hills, New York 10591

Ambrose, Karen  
<kambrose@symbiota.com>  
PHONE: (201) 772-9936  
FAX:  
9 units shipped in 1 order/s

Symbiota - Rowland  
Institute 100 Edwin H. Land  
Blvd  
Cambridge, Massachusetts 2142

Bonsall, Will  
<wabonsall@gmail.com>  
PHONE: (207) 778-3387  
FAX:  
103 units shipped in 1 order/s

Scatterseed  
Project 39 Bailey  
Road  
Industry, Maine 04938-4321

The service and tuber quality I received from you guys was, as always, superb. The particular uses we intend to make of the material are: preservation - serving as a backup for your and other institutional collections; making those varieties available to the more general public, largely via our Grassroots Seed Network (since we are allowed to charge a fee for the material we offer, it eases demand pressure on NGS and other facilities which are often overwhelmed

by non-professionals); and commercialization - in many case, we've been instrumental in moving some varieties - especially the "novelty" types - into the (niche) marketplace, as will almost certainly happen with some of the material provided by you.

What we have NOT done adequately is characterize the material with more than the most superficial descriptors - we're still working toward that. There is some data which I've been able to generate directly - stuff like synonyms, translations, historical background, etc. I intend to pass along to you as I collect it.

<De Jong response to above: I don't think I've ever heard anyone say that their work helps to relieve demand on the NGS. In your case, though, I completely agree>

Bonsall reply: I've been especially aware of that since a couple of conversations with (?? the guy who replaced Al Stoner as NGS director; name escapes me just now), regarding the system's increasing resistance to requests from farmers and gardeners, as opposed to breeders, researchers, etc. Although I quite appreciated his position, especially given the scope of the work and the finite resources, I also pointed out that the NGS, indeed USDA, has a bit of an image problem, being perceived (rightly or not) as more subservient to Monsanto, et al., than general taxpayers. Moreover, in times of hawkish budgets, having a larger server group as your lobbyists can only be helpful. I'm well aware of the concern about "hobbyists" abusing the system with frivolous requests; OTOH, I remember one of the regional curators pointing out that in his experience such people were usually very moderate and responsible in their requests, whereas some doctoral researchers would make some absurd demands ("all of your edible pod peas"), while having no intention of propagating or maintaining stocks, or even appreciating what they were asking for.

That was one of the motivations for my requesting so much NGS stuff over the years: I try to look at GRIN through the eyes of gardener and subsistence farmers and guess what might appeal to them, and also what might find demand in the niche seed trade. By being a liaison with the System, it relieves it of much supposed burden, while exposing a different target-clientele to the wonders of what's out there. So much of that stuff is now part of the US horticultural landscape and even the commercial seed trade. I'm proud of that.

And also of course I like to feed stuff from the grassroots seed saving community INTO the System; although it may not contain the genetic diversity of Vavilovian centres, it's a lot cheaper for me to collect than, say, mounting a pear-collecting expedition to the Crimea.

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Chiorini, Jay  
<jchiorin@yahoo.com>

PHONE: \*\*\*\*\*

FAX:

25 units shipped in 1 order/s

14651 Viburnum Drive  
Dayton, Maryland 21036

The material was viable and grew well. The service was great. I used it to try new variety of potatoes similar to those I had tried recently in japan but was not able to find in the US. I would recommend it to others.

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Chirigliano, Alejandro  
<alechirigliano@gmail.com>  
PHONE: (908) 764-3611  
FAX:

880 Wyoming Avenue  
Elizabeth, New Jersey 7208

3 units shipped in 1 order/s

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Chirigliano, Emiliano  
<echirigliano1028@gmail.com>  
PHONE: (908) 764-3611  
FAX:

Union County  
FFA 880  
Wyoming Avenue  
Elizabeth, New Jersey 7208

2 units shipped in 1 order/s

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Daubek, Dennis  
<daubek85@yahoo.com>  
PHONE: (315) 806-5905  
FAX:

B and D Farms  
930 Country Route 1  
Oswego, New York 13126

1 units shipped in 1 order/s

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Enburg, Patrick  
<patrick@enburg.info>  
PHONE: (530) 362-8742  
FAX:

5488 C Eaker LN SW  
Bolling AFB, District of Columbia 20032

5 units shipped in 1 order/s

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Fleming, Stacia  
<sflemingster@live.com>  
PHONE: (508) 981-3056  
FAX:

Auburn Nursery Research 107  
Boyce Street  
Auburn, Massachusetts 1501

4 units shipped in 1 order/s

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Jones, Jeanne  
<jeanne.jones17@yahoo.com>  
PHONE: (857) 251-7627  
FAX:

8 Blaine Avenue - Apt 2  
Beverly, Massachusetts 1915

1 units shipped in 1 order/s

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Kleinman, Nathan  
<nathankleinman@gmail.com>  
PHONE: (215) 264-0446  
FAX:

Experimental Farm Network  
109 Oak Street  
Elmer, New Jersey 8318

14 units shipped in 1 order/s

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Leonard, Drew  
<dreweleonard@gmail.com>  
PHONE: (717) 487-3134  
FAX:

435 Meadow Drive  
Camp Hill, Pennsylvania 17011

2 units shipped in 1 order/s

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Lichtenwalner, Mr. Mark  
<kmlfarm@rcn.com>  
PHONE: (610) 965-5214  
FAX:

4939 Indian Creek Road  
Macungie, Pennsylvania 18062

54 units shipped in 1 order/s

My dealing with the genebank last year was a little unusual. Bob Leiby requested 50 field ready plantlets that I agreed to grow. He made all the arrangements. This was a last minute

decision and rather late in the season, so I was pleasantly surprised the staff was able to put together nice plantlets so quickly. A few of the plantlets got damaged over shipping, this wasn't a serious problem, but disappointing to see nice material get beat up. I don't know if there was a fee for this service? I can understand funding is probably tight and the genebank needs to conserve money. My suggestion is to offer better shipment packaging to clients if they are willing to pay for the extra cost.

Bob had a client that wanted Stobrawa to test for alcohol production. Here on my farm, this variety grew well, showed good vigor and respectable yield. The downside is they were extremely ugly, many odd shapes and some growth cracks.

I'm still doing some breeding work, will scale back a little this year, but hope to do more next year. I'm shifting my objectives slightly. My demand for bagged table potatoes has almost disappeared, so I can hardly call myself a potato farmer anymore. I do have a small demand for Lehigh, this has become my customer favorite for those who still know how to cook potatoes. Last summer I seemed to have more customers buying specialty varieties. It was encouraging to see more people buying potatoes, but the quantity is still very small, the sales are in quart boxes, not bags. Carola sells well, nice bright skin and good flavor. Red Thumb was popular last year, probably again because it had a nice bright red skin. The blue flesh potatoes are gaining popularity, I credit this to some news articles about their health benefits. Sorry, but I like Magic Molly better than Adirondack Blue. So I'm going to do more work with the specialty types, I have a few advanced line to look at this year. If i request material from the genebank in the future, it will likely be to expand my resources for specialty breeding work.

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Manuel, Brandon  
<bpmanuel44@gmail.com>  
PHONE: (724) 903-0255  
FAX:

134 Denny Road  
Valencia, Pennsylvania 16059

1 units shipped in 1 order/s

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Miltz, Timothy  
<tfmiltz@gmail.com>  
PHONE: (724) 471-2767  
FAX:

547 Locust Street  
Indiana, Pennsylvania 15701

3 units shipped in 1 order/s

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Pierce, Nathan  
<nathanpierce@cox.net>  
PHONE: (401) 284-7691  
FAX:

19 Oakwoods Drive  
Wakefield, Rhode Island 2879

24 units shipped in 1 order/s

The USDA GRIN model for germplasm distribution is, in my opinion, a precious resource for breeders to receive valuable and unique germplasm. With so many variables involved in food growing across our planet, the resources available through USDA-GRIN are more important than ever before, and the genetic diversity represented in the germplasm is invaluable. The need to rely on these resources in an ever changing world in which germplasm in the wild is increasingly lost, makes the USDA-GRIN resource pool more important than ever before.

In 2015, I received 18 accessions of potatoes (in vitro, tuber and botanical seed), mostly ones noted with Late Blight resistance, with a few others as primitive cultivars. These will be used in a multi-year breeding program to seek tuber clones with Late Blight resistance as well as other traits such as flesh color, cooking flavor, fingerling or primitive shapes and high yield as grown organically with little to no additional inputs in the Northeast United States.

Of the 18 accessions, 9 will be regrown again this year as clones and crosses made from them to other varieties. Of primary interest in these clones this year are the following, with specific notes given as to reasons why I will regrow these:

PI 657148 (Chaposa) – High yield, desirable appearance, low disease, russeted skin

PI 657138 (Muruta) – High yield, desirable appearance, low disease

PI 666964 (Saikai 35) – desirable appearance, culinary taste, low disease

PI 662322 (Picasso) - desirable appearance (very pretty tubers), low disease

PI 619144 (Pirampo) – low disease, good yield, ease of crossing with other diploids, primitive shape

In addition to this, I will be growing out botanical seed (TPS) from the following accessions and selecting from these in future years:

PI 657148 (Chaposa)

PI 657138 (Muruta)

PI 666964 (Saikai 35)

PI 662322 (Picasso)

PI 619144 (Pirampo)  
PI 672073 (Igorota LBR 1-5)  
PI 661982 (Barbara)

I also placed some tubers of 14 of the accessions into what became an unplanned, very wet field with high water table. This resulted in an environment for selecting for tolerance to high soil moisture/wet soil (this was not intended, high amounts of rain early in the summer caused the water table to rise dramatically). Overall, yields were low in this area, and some seed tubers rotted, but the following were identified as having acceptable yields under these conditions.

PI 672073 Igorota LBR 1-5  
PI 666964 Saikai 35  
PI 662322 Picasso

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Royer, Justin  
<royerj@tapestryschool.org>  
PHONE: (201) 213-9059  
FAX:  
1 units shipped in 1 order/s

65 Great Arrow Avenue  
Buffalo, New York 14216

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Sanchez, Louis A.  
\*\*\*\*\*  
PHONE: (718) 388-5059  
FAX:  
2 units shipped in 1 order/s

Scatterseed Project  
67 Manhattan Avenue, Apt. 6N  
Brooklyn, New York 11206

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Van Eck, Joyce  
<jv27@cornell.edu>  
PHONE: (607) 254-1284  
FAX: 607-254-1242  
3 units shipped in 1 order/s

Cornell University  
The Boyce Thompson Institute  
Ithaca, New York 14853

The service was prompt and it was easy to find what I needed. The material was viable. We used the plants as starts to bulk up the number of in vitro Desiree plants to use for transformations.

## 2016 NRSP-6 Germplasm Utilization Report - Southern Region

Compiled and Submitted by Craig Yencho, Southern Region Representative

### Potato Research Programs and Use of NRSP-6 Stocks in the Southern Region

There are three land grant Universities in the Southern Region with on-going active potato improvement and/or research programs utilizing NRSP-6 stock: North Carolina, Texas and Virginia. Several other universities in the southern states periodically conduct potato research utilizing NRSP-6 stock.

During 2015 the potato genebank received requests for 1,111 NRSP-6 potato stocks from 32 individuals and/or entities in 9 states (AR, FL, GA, KY, NC, OK, SC, TN, TX). The requests came from a wide range of stakeholders from home gardeners (24 individuals requesting a total of 238 accessions) to university scientists (8 programs requesting a total of 873 accessions).

Below is one unique email report from Mars Hill, NC that captures the enthusiasm of a western North Carolina hobby farmer located in the Blue Ridge Mountains. Obviously, this grower is very supportive of the NRSP-6 project efforts.

**From:** [Ryderann@aol.com](mailto:Ryderann@aol.com) [<mailto:Ryderann@aol.com>] **Sent:** Sunday, May 29, 2016 7:00 AM **To:** Schartner, Jesse <[Jesse.Schartner@ARS.USDA.GOV](mailto:Jesse.Schartner@ARS.USDA.GOV)> **Subject:** Re: NRSP-6 News

*To the Ladies and Gentlemen of ARS-GRIN,*

*Thanks to you, I am one season closer to my goal of discovering/breeding the finest potatoes for my area of the Western North Carolina mountains.*

*The wide variety of tubers and plantlets from all over the world that you make available star in my trial potato patch. This year I'm featuring Saikai 35 crosses...beautiful strong, healthy plants...and am also crossing Huaycu and Amey with high antioxidant reds and blues. The very delicious Guincho Negra is a big producer for me. Cruza 148 is a dandy late potato here. The South Korean Valleys are outstanding here. The Scandinavian Troll and Bjorna thrive in the conditions here. The Spanish Fina de Carballo will probably be my #1 boiler.*

*This is such an interesting project, and I want to express my sincere appreciation for your work and determination to bring these widely varied varieties to those of us who are working on similar efforts.*

*Best regards always,*

*Ann Ryder  
Mars Hill, NC*

### University Reports

**North Carolina State University - Craig Yencho and Mark Clough**



The goal of the North Carolina breeding program is to develop potato cultivars that are adapted to North Carolina, and the mid-Atlantic and southeastern US. We are a member of the NE1231 (formerly NE1031) Regional Potato Variety Development Project, and we collaborate with the USDA-ARS, Univ. of Maine (ME) and Cornell University (NY) potato breeding programs in the east, as well as other potato breeding programs in the US and Canada.

*Breeding and Variety Development* - The bulk of our breeding work is conducted at the Tidewater Research Station (NCDA&CS)/Vernon G. James Research and Extension Center (NCSU) in Plymouth, NC. We also conduct 4-5 on-farm trials each year as part of our variety development efforts. Crossing work is done at our greenhouses in Plymouth, and we grow and share mini-tubers with the USDA-ARS yearly. In 2015, we planted 19,694 single-hills and selected 506 clones resulting in a 2.6% selection rate. This is on par with our average selection rate. Out of the 343 clones in our 6-hill and 12-hill plots, 62 (18%) were selected for future evaluation. In the 20-hill and specialty 60-hill plots, 84 clones were planted with 26 (31%) being selected for further evaluation. In our 60-hill plots, 28 clones were planted and 8 (29%) were selected.

Yield trials are conducted on-farm and/or at the TRS/VGJREC. We try to evaluate advanced clones and newly released varieties at more than one site in NC each year, but funding reductions have begun to severely limit these efforts. During 2015, we evaluated a total of 241 advanced and preliminary clones in on-farm and research station yield trials. Twenty-two of these were NE-1231 entries, eleven were entries from the Snack Food Association, and the remainder were preliminary lines from the USDA-ARS BARC, University of Maine, Cornell University, Colorado State University, Wisconsin, Michigan State University and NCSU potato breeding programs. The trials are described in detail in our NC Potato Variety Trial and Breeding Report 2015 (50 pp.). This report is also available on our website at: <http://potatoes.ncsu.edu>. NC also hosts the website and database for the NE1231 project, and the database for the National Chip Processors Trial.

*Germplasm Development* - To address the internal heat necrosis (IHN) problems endemic to the mid-Atlantic and southeastern states, we have been working on a long-term project with Dr. Kathleen Haynes. The materials for this study were derived from 4x-2x *S. tuberosum* x (*S. phureja* X *S. stenotomun* (phu-stn)) hybrids developed by Dr. Haynes. We have also develop a mapping population, B2721, a cross between B1829-5 and Atlantic. B2721 was genotyped with the Infinium<sup>®</sup> 8303 SNP array developed by the USDA-NIFA SolCAP project and quantitative trait loci (QTL) were detected for IHN on chromosomes 1, 5, 9, and 12. Genetic effect models of the QTL explained roughly 28 and 25% of the variation for incidence and severity, respectively. Using the SNP gene annotations and the potato reference genome we have tentatively identified a candidate gene involved in IHN, *vacuolar cation/proton exchanger 1a*, that was closely linked to a QTL for IHN susceptibility. The B2721 population has also been phenotyped for chip color, specific gravity, and reaction to scab. Molecular markers linked to all these traits are currently being developed.

Our Colorado potato beetle (CPB) germplasm enhancement project seeks to introgress CPB resistance derived from *Solanum berthaultii* and *S. chacoense* into cultivated potato. The project began in 1998 using materials obtained from the USDA-ARS Potato Genebank, the USDA-ARS

BARC, and Cornell University. We screen lines for resistance and adaptation using a rapid advance strategy that consists of simultaneous selection for CPB resistance and adaptation using separate plots planted the same year.

Much of the germplasm requested by our program from the NRSP6 project this year were materials that possessed PVY resistance derived from *S. andigena* and *S. stoloniferum*, or were high in anthocyanin content. These are two additional traits that we intend to incorporate into our program in the coming years.

#### NC Peer-reviewed manuscripts – 2015

Haynes KG, Gergela DM, Halseth DE, Menasha SR, Siczka JB, Yencho GC, Clough ME, Henninger MR, Qu XS, Christ BJ, et al. 2015. Peter wilcox: A new purple-skin, yellow-flesh fresh market potato cultivar with moderate resistance to powdery scab. *American Journal of Potato Research* 92(5):573-81.

#### **Texas A&M University – J. Creighton Miller, Jr.**

Texas – J. Creighton Miller, Jr., Douglas C. Scheuring, Jeffrey W. Koym, Julien G. Levy, and Cecilia Tamborindegy

The Texas Potato Breeding and Variety Development Program requested the Mini-Core collection from the US Potato Gene Bank, Sturgeon Bay, WI for evaluation of potato psyllid (*Bactericera cockerelli*) and/or *Candidatus Liberibacter solanacearum* (Lso) resistance.

Seed of the 80 accession Mini-Core collection were planted February 16, 2016 in College Station, TX. Seedlings were transplanted March 11 to one-gallon pots and 9cm paper pots. Four one-gallon treatment pots were placed in one greenhouse and two one-gallon control pots were placed in another greenhouse. On April 21, one male and one female psyllid were caged on a leaf in the upper third of the canopy and allowed to feed for one week, at which time they were removed. Live and dead insects and presence of eggs were noted. Five weeks after infection, leaf samples from each plant were collected for PCR verification of infection at a later time. Plant Lso symptoms were noted on treatment plants and compared to the controls.

On April 8, the 9cm paper pots were transplanted into insect proof cage structures in the field near Springlake, TX. Four plants of each clone were planted together in a treatment cage and two in a control cage. Based on preliminary greenhouse data, 11 clones were selected for re-evaluation in the field. Again, male and female insects were caged on each selected treatment plant on May 24. One week later, June 1, insects were removed and live, dead, and eggs were noted. Five weeks after infection, leaf samples from each plant were collected for later PCR verification of infection. Plant Lso symptoms were noted on treatment plants and compared to the controls.

Tubers of 30 clones were obtained from Sturgeon Bay. These were tubers from the grow-out of PI material that the US Potato Gene Bank conducts annually. This material was planted in one-gallon pots in the greenhouse and as tubers in the field. The same protocol as above was followed. Since the trial was planted about two weeks later, preliminary greenhouse data was

not obtained in time to decrease the number of field retest. All of the treatment plants in both the greenhouse and field were treated with insects.

Final results are not available at this time as the study is still in progress.

The Texas Potato Variety Development Program continues to strive for the development and identification of improved early maturing russet, colored flesh, chip, and red varieties adapted to Texas growing conditions, in order to enhance the competitiveness of the Texas potato industry. In 2015, 79,312 first-year seedlings representing 493 families were grown, and 488 original selections were made. We cooperate with the North Dakota, USDA/ARS Aberdeen, ID, Oregon, and Colorado breeding programs through exchange of first-year seedling tubers and/or advanced selections. We continue to participate in the Western Regional Trials (russet, red/specialty and chip) and the Southwestern Regional Trials (russet, red, specialty, and chip), and the USPB Fast-Track National Chip Processing Trial. ATX91137-1Ru (Reveille Russet) an early maturing high yielding variety was released in 2015. A major effort continued in 2015 involving research on the Zebra Chip Complex with emphasis on screening for host plant tolerance/resistance including evaluation of several NRSP-6 accessions. Additional information about the Texas breeding program can be found at: <http://potato.tamu.edu>

### **Reports Produced in 2015**

Miller, C., D. Scheuring, and J. Koym. 2015. Texas Potato Breeding Report, 2014. Texas A&M AgriLife Research, College Station and Lubbock. 321p.

Miller, J.C., Jr., J.W. Koym, D.C. Scheuring, and J.P. Miller. 2015. Southwest Regional Potato Variety Trial Report 2014. Texas A&M AgriLife Research, College Station and Lubbock. 21p.

Miller, J.C., Jr., J.W. Koym, D.C. Scheuring, and J.P. Miller. 2015. Western Regional Red/Specialty Variety Trial Report 2014. Texas A&M AgriLife Research, College Station and Lubbock. 24p.

Miller, C., J. Koym, and D. Scheuring. 2015. 2015 Field Day Handbook. July 30, 2015. Texas Potato Variety Development Program. Texas A&M AgriLife Research, College Station and Lubbock. 46p.

### **Peer-reviewed Manuscripts**

Levy, J.G., D.C. Scheuring, J.W. Koym, D.C. Henne, C. Tamborindegy, E. Pierson, and J.C. Miller, Jr. 2015. Investigations on putative Zebra Chip tolerant potato selections. *Am. J. Potato Res.* 92: 417-425.

Blessington, T., D.C. Scheuring, M.N. Nzaramba, A.L. Hale, L.Reddivari, T.A. Vestal, J.E. Maxim, and J.C. Miller, Jr. 2015. The Use of Low-Dose Electron-Beam Irradiation and Storage Conditions for Sprout Control and their Effects on Xanthophyls, Antioxidant Capacity, and Phenolics in the Potato Cultivar Atlantic. *Amer. J. Potato Res.* 92:609-618.

S. H. Jansky,\* A. O. Charkowski, D. S. Douches, G. Gusmini, C. Richael, P. C. Bethke, D. M. Spooner, R. G. Novy, H. De Jong, W. S. De Jong, J. B. Bamberg, A. L. Thompson, B. Bizimungu, D. G. Holm, C. R. Brown, K. G. Haynes, V. R. Sathuvalli, R. E. Veilleux, J. C. Miller, Jr., J. M. Bradeen, and J. M. Jiang. 2016 Reinventing potato as a diploid inbred line-based crop. *Crop Sci.* (in press).

### **Virginia Tech – Richard Veilleux**

We have not requested germplasm from NRSP-6 since 2013 when we received the Andean tetraploid cv. Alca Tarma. Alca Tarma was grown in a walk-in growth chamber. Leaf tissue was harvested from young plants, RNA extracted and cDNA was subjected to RNAseq analysis. Alca Tarma has been used extensively at CIP, in particular a population of 173 dihaploids has been extracted from it for use in QTL mapping of various traits, most notably for our purpose, iron accumulation in tubers. Having the maternal cultivar available in the germplasm repository in the US for RNAseq analysis allowed us to examine after aligning reads to the DM genome the allelic composition of candidate genes identified through collaboration with CIP. We could then design primers for allelic discrimination using a fluorescent RT-PCR protocol in order to validate (or not) the participation of candidate genes in phenotypic variation among the dihaploids. The work is in preparation for publication.

### **VA Peer-reviewed manuscripts - 2015**

Lu N, Zhao B, Pereira A, Shulaev V, Veilleux RE (2015) Anther culture induces transposable element movement in potato. *Plant Cell Tissue and Organ Culture* 120: 361-366

### **University of Florida - Lincoln Zotarelli**

The UF is not engaged in breeding activities but we did request a large amount of germplasm from the NRSP-6 program for germplasm screening activities regarding nitrogen utilization.

### **Peer-reviewed Scientific Journals**

Raymundo, R., S. Asseng, R. Prasad, U. Kleinwechter, J. Concha, B. Condori, W. Bowen, J. Wolf, J.E. Olesen, Q. Dong, **L. Zotarelli**, M. Gastelo, A. Alva, M. Travasso, R. Quiroz, V. Arora, W. Graham, C. Porter. 2016. Performance of the SUBSTOR-potato model across contrasting growing conditions. *Field Crops Research*. doi:10.1016/j.fcr.2016.04.012.

Reyes-Cabrera, J., **L. Zotarelli**, M.D. Dukes, D.L. Rowland., S.A. Sargent. 2016. Soil moisture distribution under drip irrigation and seepage for potato production. *Agricultural Water Management*. 169: 183-192.

Rens, L.R., **L. Zotarelli**, A. Alva, D.L. Rowland, G. Liu, K.T. Morgan. 2016. Fertilizer nitrogen uptake efficiencies for potato as influenced by application timing. *Nutrient Cycling in Agroecosystems*. 104: 175-185.

Liao, X., Z. Su, G. Liu, **L. Zotarelli**, C. Snodgrass. 2016. Impact of soil moisture and temperature on potato production using seepage and center pivot irrigation. *Agricultural Water Management*. 165: 230-236.

Rens, L.R., **L. Zotarelli**, D.J. Cantliffe, P. Stoffella, D. Gergela, D. Fourman. 2016. Commercial evaluation of seasonal distribution of nitrogen fertilizer for potato. *Potato Research*. 59: 1-20.

Makani, M.N., S.A. Sargent, **L. Zotarelli**, D.J. Huber, C.A. Sims. 2015. Irrigation method and harvest time affect storage quality of two early-season, tablestock potato (*Solanum tuberosum* L.) cultivars. *Scientia Horticulturae*. 197: 428-433.

Rens, L.R., **L. Zotarelli**, D.J. Cantliffe, P. Stoffella, D. Gergela, D. Fourman. 2015. Rate and timing of nitrogen fertilizer application on potato 'FL1867' Part II: Marketable yield and tuber quality. *Field Crops Research*. 183: 267-275.

**Zotarelli, L.**, L.R. Rens, D.J. Cantliffe, D. Gergela, P. Stoffella, D. Fourman. 2015. Rate and timing of nitrogen fertilizer application on potato 'FL1867' Part I: plant nitrogen uptake and soil nitrogen availability. *Field Crops Research*. 183: 246-256.

Byrd, S.A., D.L. Rowland, J. Bennett, **L. Zotarelli**, D. Wright, A. Alva, J. Nordgaard. 2015. The relationship between sap flow and commercial soil water sensor readings in irrigated potato (*Solanum tuberosum* L.) production. *American Journal of Potato Research*. 92: 582-592.

Rens, L.R., **L. Zotarelli**, D.J. Cantliffe, D. Gergela, P. Stoffella, D. Fourman. 2015. Biomass accumulation, marketable yield, and quality of Atlantic potato in response to nitrogen. *Agronomy Journal*. 107: 931-942.

### **Peer-reviewed Extension Publications in the Electronic Data Information Source (EDIS)**

**2013-2016** [www.edis.ifas.ufl.edu](http://www.edis.ifas.ufl.edu)

Mwatuwa, R., C.T. Christensen, **L. Zotarelli**. 2016. University of Florida Potato Variety Spotlight: 'Atlantic'. Horticultural Sciences Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida EDIS Publication HS1278. 3p. <http://edis.ifas.ufl.edu/hs1278>

Mwatuwa, R., C.T. Christensen, **L. Zotarelli**. 2016. University of Florida Potato Variety Spotlight: 'Marcy'. Horticultural Sciences Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida EDIS Publication HS1277. 3p. <http://edis.ifas.ufl.edu/hs1277>

**Zotarelli, L.**, S.A. Sargent, P. Dittmar, M. Makani<sup>P</sup>. 2016. Potato vine killing or desiccation. Horticultural Sciences Department. Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. EDIS Publication HOS925. 4p. <http://edis.ifas.ufl.edu/hs181>

**Zotarelli, L.**, P.J. Dittmar, P.D. Roberts, S.E. Webb. 2015. Potato production. Chapter 13. In: Dittmar et al. (Eds.). 2015-2016 Vegetable Production Handbook for Florida, Vance Pub., Lenexa, KS. p.132-143. EDIS Publication HS733. p.161-172. <http://edis.ifas.ufl.edu/CV131>



**Western Region Report - NRSP-6 Technical Committee  
David G. Holm**

During 2015, NRSP-6 supplied stocks to the following Western states: Arizona, California, Colorado, Hawaii, Idaho, Nevada, New Mexico, Oregon, and Washington (Table 1). Western Region USDA/ARS requests are not included in this report.

Thirty-six entities via 42 requests ordered 2,223 units. Potato materials were requested by universities and research institutes (University of Arizona, University of California, Colorado State University, Cosumnes River College, University of Idaho, International Institute of Los Angeles, Montana State University, University of Nevada, Oregon State University and Washington State University) and many private companies and farms (Table 1).

**Table 1. NRSP-6 Distribution in the Western Region - 2015.**

Name	Organization	City	State	Reported
Milton Agader	Twin Bridge Farms	Waialua	HI	
Elias Bassil	University of California	Davis	CA	
Randy Bauscher	B&H Farms	Rupert	ID	
Zach Carlson		Phoenix	AZ	
Nicolas Diaz		San Diego	CA	
Lorie Ewing	University of Idaho	Moscow	ID	✓
Mathew Farnum		Everett	WA	
Robert Foss	International Institute of Los Angeles	Los Angeles	CA	
Fahrettin Goktepe	SunRain Potato Varieties	Idaho Falls	ID	
Ryan Graebner	Oregon State University	Corvallis	OR	
Dr. Jade d'Alpoim Guedes	Washington State University	Pullman	WA	
Humberto Hernandez	University of Arizona	Yuma	AZ	✓
Christopher Homanics	Skipley Garm	Snohomish	WA	✓
Rob Johnson	Woodcrest Gardens	Riverside	CA	
Carolyn Keller	Colorado State University	Center	CO	✓
Dylan Kosma	University of Nevada	Reno	NV	
Michele Krucker	J. R. Simplot Company	Boise	ID	
Krista Ledesma	WSU Master Gardeners	Marysville	WA	
Rick Machado	Machado Farms	Menifee	CA	
Dinusha Maheepala	University of California	Riverside	CA	
Josh McComas		Fresno	CA	
Pamela O'Boyle		Sandia Park	NM	✓
Garry Pearson	University of California	Davis	CA	
Caius Rommens	Nightshade LLC	Boise	ID	✓
Garth Schaefer	Woodbine Ecology Center	Sedalia	CO	
Lura Schroeder	University of Idaho Extension	Aberdeen	ID	
Joseph Simcox	The Rare Vegetable Seed Consortium	Belen	NM	
Jane Smith	IEH	Lake Forest Park	WA	✓
John Stewart	Gardens of Eden	Cashmere	WA	

Han Tan	University of California	Davis	CA	
Kiwamu Tanaka	Washington State University	Pullman	WA	
Amy Tran		El Monte	CA	
Sam Tran	Cosumnes River College	Sacramento	CA	
Peter van Hest	Bejo Seeds, Inc.	Oceano	CA	✓
Thomas Wagner		Everett	WA	✓
Roy Wiersma		Alta Loma	CA	✓

## General Reports

### Thomas Wagner

The materials arrived in good condition. I use the potato clones for breeding and for nutritional analysis . The TPS derived from all lines, either OP or crossed in inventoried for future use.

### Jane Smith

Hello, you hard working folks at the potato seed bank. At the time of my request I was working in a company that was making genetic tags for all sorts of plants. I think we smashed up some of the seeds and extracted DNA from them. I have really forgotten most of the details involved from that point on. I really appreciated your help at the time.

### Carolyn Keller

I have received several potato varieties from the US Potato Genebank in 2015. The tissue culture plantlets arrived in good condition in test tubes and are growing well in our system. One of the lines did have PVY but this was noted on the initial paperwork that we received. It is in the process of being cleaned up. As for the impact and use of the material, it was requested by David Holm. He is maintaining the seed stocks for crossing and other research objectives such as carotenoid content screening.

### Roy Wiersma

The Burbank potato (AV 40) was requested from the Potato Introduction Project to replace an earlier request which had grown well but then mysteriously died out. Finding the "lost" Burbank hybrids has been a passion of mine and this one is the Holy Grail of all of them. The educational impact of this knowledge backed by living samples is of great significance in getting others to grasp historical plant developments. Thankfully, the National Clonal Germplasm Repository maintains such historic varieties.



## **Humberto Hernandez**

Actually the reason why potato germplasm was used at the University of Arizona's experimental plots in Yuma, Arizona, was due to a service we provided to Mr John Bamberg from the US Potato Genebank. The service consisted of growing several cultivars in order to evaluate a possibility of successfully growing potato plants during our winter season using tunnel covers. The cultivars were not able to survive a cold freeze and that was the end of the trial.

## **Pamela O'Boyle**

I ordered the germplasm for personal use but the mice got to it before I did.

## **Lorie Ewing**

We received nine lines from the Potato Genebank on November 20, 2014. All lines arrived in excellent condition. When samples were sent to Idaho Crop Improvement Association to be certified, they tested negative for all pertinent diseases.

A Washington State potato grower has been evaluating these lines for suitability in the potato specialty market. He has ordered plantlets each spring to produce minitubers in his greenhouse. Currently, he is still in the evaluation stage and increasing early generations of seed.

## **Peter van Hest**

In 2015 Bejo seeds, Inc. requested and received various clones and true seed lines from the collection of the Irish potato (*Solanum*) maintained by the National Plant Germplasm System. Typically 40 – 75 lines are acquired each year.

For more than a decade, Bejo seeds has received true seed, in vitro and in vivo material in this fashion in order to evaluate these lines in its breeding program to create true seed potato varieties.

Of the hundreds of clones received over the years, 31, or about 4% of total clones, have provided their genes towards potential parent lines which are currently being evaluated.

Because of the breadth of genetic material available from the National Plant Germplasm System, access to it is of utmost importance to Bejo Seeds, and it is highly appreciated to receive the material.

Over the years there has been a rare instance of questionable phytosanitary condition, but that is the rare exception rather than the rule. In addition, we were alerted to this possibility and to destroy the clone in question, which speaks of the high standards the NPGS follows.

In summary, Bejo Seeds, Inc, is very appreciative of the clones available from the Potato Genebank, and will continue with yearly requests.

### **Chris Homanics**

In 2015, I requested 14 ad hoc tubers lines to evaluate in organic ag conditions for disease resistance, drought tolerance, frost resistance, fertility, and worthiness as market varieties. All material received was in good order and sent in a timely fashion especially considering it being offered at no cost. I have been growing Amey, Elmer's Blue, Clavella, and Papa Cacho for several years and re-requested these varieties to replenish with disease-free stock. This is one of the many areas where USDA GRIN remains a crucial part of successful potato growing in the US and beyond due of course to the clonal nature of potatoes and diseases.

Due to extreme heat last season, potato berries were very scarce throughout all my vars in the field, so was unable to accurately assess the fertility of the various ad hoc tuber lines. However, since 2014 I have been impressed by Amey's sheer quantity of fruits produced, holding their flowers and fruits through 100 F temps is impressive, however most berries were blind of seed. This year I am again attempting to cross Huaycu with other red fleshed varieties and Guadacho to other purple fleshed varieties. I am keen to attempt a cross between Jancko Ajanhuiri and several new Sisu Ajanjuiri derived lines looking for maintaining frost resistance while hopefully improving on fertility. I hope to be able to control my variables enough to make a better assessment of frost tolerance.

I am a market farmer, seedsman, plant breeder, and seed saver residing in Coburg, OR. Looking through my collection of currently 350 varieties and breeding lines, it would be impossible to overlook the great impact the USDA GRIN repository has had on my work thus far. We should all be proud that such an open and collaborative institution exists here in the US and I would sincerely hope that Congress would do everything in it's power to continue to fund this agencies important work in helping feed the world.

### **Caius Rommens**

Material from the U.S. Potato Genebank is currently being used to develop varieties for the Inland Northwest.

Preliminary screening of 39 European varieties in 2014, 2015 (and now 2016) identified one variety with a yield potential exceeding that of some currently available American varieties, such as Russet Burbank, when exposed to heat and drought stress. This particular variety produces large and uniform tubers with a slightly lower specific gravity than Russet Burbank.

Crosses between particular parent plants yielded two putative varieties with characteristics that may eventually justify commercialization. One of these putative varieties excels in vigor, stress tolerance and yield, and produces large tubers with a similar specific gravity

as that of Russet Burbank; the other variety displays standard agronomic characteristics, and produces tubers with a high degree of uniformity and low amount of reducing sugars. French fries from these tubers are crispier than the fries of some commercial fry potatoes such as Russet Burbank.

A preliminary screening of 75 diverse accessions of ten wild potato species identified several unique plants with desirable traits including stress tolerance and a particular type of pest control.

It should be noted that one of the unique wild potato plants displayed an exquisite phenotype that might make it suitable for development as an ornamental variety.

Sixty-five recently acquired primitive varieties from South America are currently being grown for evaluation of a range of sensory characteristics, to be used in subsequent breeding programs.

The Potato Genebank provides an essential and excellent resource for breeding programs throughout the United States, and is very much acknowledged for their professional support.

## USDA/ARS Report on use of NRSP-6 Germplasm in 2015

Rich Novy

June 21, 2016

In 2015, there were 2204 units (2302 units in 2014) shipped in 51 orders to twelve USDA/ARS cooperators in seven states. The seven states represented were: California, Georgia, Maryland, New York, Idaho, Washington, and Wisconsin (Table 1). Eleven of the 12 recipients responded regarding the use of requested germplasm.

Varied usage of NRSP-6 germplasm was reported with research highlights given below. More specific detail of research provided by each respondent is also presented in the remainder of this report.

### **Research Highlights:**

- ✓ Disease Resistance: Zebra chip, late blight, *P. syringae* pv. tomato, and early blight
- ✓ Pest Resistance: Potato psyllid and potato cyst nematode
- ✓ Enhanced Tuber Qualities: Cold-induced sweetening resistance and increased tuber calcium
- ✓ Unique/Enhanced Marketability: Reduced tuber greening, exaggerated fingerling shape, and deeper yellow flesh with use of *Criolla* egg yolk type potatoes
- ✓ Nutritional Improvement: Increased Folate
- ✓ Environmental tolerances: Improved salinity and heat tolerances
- ✓ Novel Traits: Floral mutants, enhanced species tuberization (earlier maturing with large tubers), mineral uptake in epiphytic potato species, fatty acid profiling of potato TPS, species' hyperspectral reflectance patterns and use in taxonomic classification

**Table 1. NRSP-6 Germplasm Distribution to USDA/ARS in 2015.**

Recipient	City	State	Response
Bamberg, John	Sturgeon Bay	WI	Yes
Bethke, Paul	Madison	WI	No
Brown, Chuck	Prosser	WA	Yes
Cooper, Rodney	Wapato	WA	Yes
Halterman, Dennis	Madison	WI	Yes
Haynes, Kathy	Beltsville	MD	Yes
Jansky, Shelley	Madison	WI	Yes
Jarret, Robert	Griffin	GA	Yes
Novy, Rich	Aberdeen	ID	Yes
Senalik, Doug	Madison	WI	Yes
Wang, Xiaohong	Ithaca	NY	Yes
Wells, Karen	Parlier	CA	Yes

### **Reported Use of NRSP-6 Germplasm:**

#### **John Bamberg, Sturgeon Bay, WI**

The uses of NRSP6 germplasm ordered by Bamberg will be covered fully in the TAC genebank report. In summary, we are involved in cooperative evaluation work across the broad spectrum of traits which make up the specialties of the genebank clients, both for producers, like Zebra chip resistance, and for

consumers, like high folate. We also do in-house research on the status and dynamics of genetic diversity, like how to compose core collections. We study germplasm technology like best seed germination practices. We do projects to document genebank germplasm, like the efforts to make color scans of all wild accessions, and take representative photos of named cultivars. We identify and study novel traits like floral mutants. We use germplasm to study exotic germplasm utilization, like how to breed nobilizing (“cultivarish”) *tuberosum* parents, use bridge cross species, and identify wild mutants with big, early tubers. For almost 25 years, we have studied the status of germplasm still in nature, using the southwest USA native potato populations as models. With a view to returning benefits to germplasm donor countries, we have long been engaged in cooperative evaluation and breeding with Peru to improve frost resistance and tuber quality.

**Publications:**

Bamberg, JB and A. H. del Rio. 2016. Accumulation of genetic diversity in the US Potato Genebank. <i>American Journal of Potato Research</i> . DOI 10.1007/s12230-016-9519-3
Bamberg, JB, AH del Rio and RA Navarre. 2016. Intuitive Visual Impressions (Cogs) for Identifying Clusters of Diversity within Potato Species. DOI 10.1007/s12230-016-9508-6
Bruce R. Robinson, Vidyasagar Sathuvalli, John Bamberg, and Aymeric Goyer. 2015. Exploring Folate Diversity in Wild and Primitive Potatoes for Modern Crop Improvement. <i>Genes (Basel)</i> . 2015 Dec 8;6(4):1300-14. doi: 10.3390/genes6041300.
Bamberg, J., Moehninsi, R. Navarre, and J. Suriano. 2015. Variation for Tuber Greening in the Diploid Wild Potato <i>Solanum microdontum</i> . <i>American Journal of Potato Research</i> 92:435-443.
Hardigan, M., J Bamberg, C Robin Buell and D Douches. 2015. Taxonomy and genetic differentiation among wild and cultivated germplasm of <i>Solanum</i> sect. <i>Petota</i> . <i>The Plant Genome</i> . 8:1:16.

**Chuck Brown, Prosser, WA**

That portion of our stakeholders that maintains an interest in specialty potatoes has asked for exaggeratedly fingerling shape in new selections. It is likely that we need parents with adaptation to long days that have extreme length and length by width ratios. One such clone is the Andean cultivar Papa Cacho. Cacho refers to the fish the chub. The shape of Papa Cacho is almost snake-like. Fortuitously NRSP-6 had done a survey of length times width and were able to collate a group of clones. Most were PI numbers, but they encompassed diploid to pentaploid ploidies. The expectation that they would not serve directly as cultivars due to lack of daylength maladaptation should be held in abeyance. I grew true seed of most of them. Some of them of them showed great vigor while not untamed growth. I am curious if they have among them some directly usable clones. If not, they can serve as a source of length in future crosses. Some of them are highly pigmented, which is a highly desirable aspect. This project will hopefully help future breeders.

### **Rodney Cooper, Wapato, WA**

All materials received from the potato Genebank were screened for resistance or tolerance to potato psyllid, *Bactericera cockerelli*, and the zebra chip pathogen, *Liberibacter solanacearum*. We have recently published on resistance to potato psyllid among *verrucosum* accessions (attached), but have yet to identify resistance to *Liberibacter*.

#### Publication:

Cooper, W.R. and J.B. Bamberg. 2016. Variation in susceptibility to potato psyllid, *Bactericera cockerelli* (Hemiptera:Triozidae), among *Solanum verrucosum* germplasm accessions. American J. Potato Res. DOI 10.1007/s12230-016-9512-x (Online First)

### **Dennis Halterman, Madison, WI**

In 2015 we published a manuscript focused on identifying novel sources of resistance to the potato late blight pathogen *Phytophthora infestans*. We screened multiple individuals from approximately 150 wild potato species accessions for both foliar and tuber resistance. We tested the ability of taxonomy, ploidy, crossing group, breeding system, and geography to predict the presence of foliar and tuber late blight resistance in wild *Solanum* spp. Significant variation for resistance to both tuber and foliar late blight was found within and among species but there was no discernable predictive power based on taxonomic series, clade, ploidy, breeding system, elevation, or geo- graphic location. We observed a moderate but significant correlation between tuber and foliar resistance within species. Although previously uncharacterized sources of both foliar and tuber resistance were identified, our study does not support an assumption that taxonomic or geographic data can be used to predict sources of late blight resistance in wild *Solanum* species:

Khiutti, A., Spooner, D. M., Jansky, S. H., and Halterman, D. A. 2015. Testing taxonomic predictivity of foliar and tuber resistance to *Phytophthora infestans* in wild relatives of potato. *Phytopathology* 105:1198-1205)

In September of 2015 we undertook a project to identify novel sources of bacterial resistance in potato. The bacteria *Pseudomonas syringae* pathovar tomato is a major problem in tomato production, but is not a major issue in cultivated potato. We began a screen of wild potato species to better understand the presence or absence of resistance or susceptibility in species related to tomato (*Solanum lycopersicon*) and cultivated potato (*Solanum tuberosum*). We ordered approximately 150 accessions from the Potato Genebank and proceeded to screen multiple individuals from each accession for their resistance phenotype. Interestingly, we found that the majority of wild species relatives are susceptible to *P. syringae* pv. tomato while all tested cultivated varieties are resistant. We plan to continue our analysis using land race varieties from the Genebank as well as multiple pathogen strains. This project has implications in the identification of novel bacterial resistance genes in potato that could be used for improvement of both potato and tomato varieties.

### **Kathy Haynes, Beltsville, MD**

Fourteen potato varieties were requested and received. I have planted them to increase and if disease free, will integrate them into our variety collection.

### **Shelley Jansky, Madison, WI**

Germplasm requests in 2015 were mainly for two projects. The first was an evaluation of mineral uptake ability in epiphytic species. This work was recently published:

Jansky, S. H., J. Roble, and D. M. Spooner. 2016. *Solanum clarum* and *S. morelliforme* as novel model species for studies of epiphytism. *Frontiers in Plant Science* 7.

The natural history of epiphytic plant species has been extensively studied. However, little is known about the physiology and genetics of epiphytism. This is due to difficulties associated with growing epiphytic plants and the lack of tools for genomics studies and genetic manipulations. In this study, tubers were generated from 223 accessions of 42 wild potato *Solanum* species, including the epiphytic species *S. morelliforme* and its sister species *S. clarum*. Lyophilized samples were analyzed for 12 minerals using inductively coupled plasma optical emission spectrometry. Mineral levels in tubers of *S. morelliforme* and *S. clarum* were among the highest for 10 out of the 12 elements evaluated. These two wild potato relatives are native to southern Mexico and Central America and live as epiphytes or in epiphytic-like conditions. We propose the use of *S. morelliforme* and *S. clarum* as model organisms for the study of mineral uptake efficiency. They have a short life cycle, can be propagated vegetatively via tubers or cuttings, and can be easily grown in controlled environments. In addition, genome sequence data are available for potato. Transgenic manipulations and somatic fusions will allow the movement of genes from these epiphytes to cultivated potato.

The second set of germplasm requests was for the second year of a field project with Dr. Phil Townsend in UW Forest Ecology. We have chosen an array of wild and cultivated relatives that span the taxonomic diversity of potato and are collecting hyperspectral reflectance data in the field. We are looking for an association between reflectance patterns and taxonomic classification.

### Three publications in 2015 were based on research using wild potato relatives from NRSP6:

Khutti, A., S. Jansky, D. Spooner, and D. Halterman. 2015. Testing taxonomic predictivity of foliar and tuber resistance to *Phytophthora infestans* in wild relatives of potato. *Phytopathology* 105:1198-1205.

Potato late blight, caused by the oomycete phytopathogen *Phytophthora infestans*, is a devastating disease found in potato growing regions worldwide. Long-term management strategies to control late blight include the incorporation of host resistance to predominant strains. However, due to rapid genetic changes within pathogen populations, rapid and recurring identification and integration of novel host resistance traits is necessary. Wild relatives of potato offer a rich source of desirable traits, including late blight resistance, but screening methods can be time intensive. We tested the ability of taxonomy, ploidy, crossing group, breeding system, and geography to predict the presence of foliar and tuber late blight resistance in wild *Solanum* species. Significant variation for resistance to both tuber and foliar late blight was found within and among species but there was no discernable predictive power based on taxonomic series, clade, ploidy, breeding system, elevation, or geographic location. We observed a moderate but significant correlation between tuber and foliar resistance within species. Although previously uncharacterized sources of both foliar and tuber resistance were identified, our

study does not support an assumption that taxonomic or geographic data can be used to predict sources of late blight resistance in wild *Solanum* species.

Ali, A. and S.H. Jansky. Fine screening for resistance to cold-induced sweetening in potato hybrids containing *Solanum raphanifolium* germplasm. *Advances in Agriculture*. vol. 2015, Article ID 327969, 4 pages, 2015. doi:10.1155/2015/327969.

Potato is an indispensable part of human food. Many wild and cultivated potato relatives have been screened to find the best germplasm to improve productivity and quality, but only a small sample of the available biodiversity has been exploited. Most wild relatives are self-incompatible diploids. Genetic variability exists within and among populations even within a species. Therefore, it is necessary to carry out fine screening to identify individuals carrying traits of interest. This study was carried out to quantify phenotypic variability for resistance to cold-induced sweetening, an important processing trait. After 4 months of storage at 4C, five families were evaluated for potato chip (crisp) color. The families were generated by crossing a single diploid clone to five plants from one accession of the wild potato relative *Solanum raphanifolium*. Analysis of variance revealed that resistance against cold induced sweetening was dependent on family and trial. This study underscores the importance of fine screening to select individuals in potato accessions for use in potato improvement.

Chung, Y.S., J. Palta, J. Bamberg, and S. Jansky. 2015. Potential molecular markers associated with tuber calcium content in wild potato germplasm. *Crop Science*. doi: 10.2135/cropsci2015.06.0370.

High tuber calcium is associated with a reduced incidence of disease and physiological disorders in potato. However, genetic variation for tuber calcium content in cultivated potato is low, limiting opportunities to study the genetic basis of this trait. We utilized wild germplasm to develop a population segregating for tuber calcium concentration. The high calcium accumulating potato wild relative *Solanum microdontum* (clone M15) was crossed to the low calcium accumulating relative *S. kurtzianum* (clone K12) and 12 F<sub>1</sub> individuals were intercrossed to create a segregating population. Significant variation in tuber calcium content was found in this population, and simple sequence repeats (SSRs) were tested for association with tuber calcium content. Twelve of 42 SSRs tested were associated with tuber calcium content. SSR4743 on chromosome 7 was found to be linked to a cation exchanger-like (*CAX3-like*) gene known to be involved with calcium uptake in plants. Breeders may utilize these molecular markers to aid in selecting plants with high tuber calcium levels to enhance tuber quality and disease resistance.

In addition, one published paper described germplasm released that was derived from NRSP6 material.

Meier, A., S. Jansky, and D. Halterman. 2015. Germplasm release: Three potato clones incorporating combined resistances to early blight from *S. palustre* and late blight from *S. bulbocastanum* into a *S. tuberosum* background. *American Journal of Potato Research*. 92:410-416. Cover article.

Three clones in a segregating population derived from a cross between the disease resistant parents +297 and K41 are being released as germplasm with resistance to both early blight, caused by *Alternaria solani*, and late blight, caused by *Phytophthora infestans*. The source of resistance to early blight in +297 is the wild species *S. palustre* and late blight resistance in K41 is conferred by the *RB* gene from *S. bulbocastanum*. These clones, named BR3, BR5, and BR85 (BR for Blight Resistant), yield well at a temperate zone latitude. In addition to containing heritable resistance to both early and late blights, these clones possess multiple other desirable agronomic traits, are fertile, and readily cross to cultivars.



**Robert Jarret, Griffin, GA**

He had conducted fatty acid profiling of true seeds that had been sent by John Bamberg.

**Rich Novy, Aberdeen, ID**

Six clones representing *Criolla* egg yolk type potatoes were requested from NRSP-6 for use in my parental crossing block in 2016. The majority of clones flowered very well with numerous hybridizations made with yellow-fleshed breeding clones and cultivars adapted to northern latitudes. Extraction of true potato seed (TPS) seed from harvested berries will be completed this summer allowing a better idea of success in the production of *Criolla* hybrid TPS that may provide specialty types having deeper yellow pigmentation in the tuber flesh than current yellow-fleshed varieties. In addition, three BR clones as described by Jansky above were requested and used as parental clones in hybridizations to russet-skinned clones for the introgression of early blight and late blight resistances from *S. palustre* and *S. bulbocastanum*, respectively into the long tuber, russet-skinned market class that predominates in the western U.S.

**Doug Senalik, Madison, WI**

These samples are being used for salinity resistance investigations by Marina Iovene (formerly part of our laboratory). No data is yet available on results.

**Xiaohong Wang, Ithaca, NY**

We have tested many accessions of wild potato species received from NRSP-6 for resistance against potato cyst nematodes with a goal of identifying new potato germplasm with broad-spectrum resistance to PCNs. In addition, we have used wild potato species in the study of understanding the molecular mechanisms of PCN infection of host plants.

**Karen Wells, Parlier, CA**

She had conducted heat tolerance evaluations of germplasm that had been sent by John Bamberg.



Agriculture and  
Agri-Food Canada

Agriculture et  
Agroalimentaire Canada



# Report to the NRSP-6 Technical Committee

## Ft. Collins, CO, June 14, 2016

**B. Bizimungu**  
Agriculture and Agri-Food Canada

Canada

# Introduction and utilization of potato accessions from NRSP-6 Project

- In 2015, accessions from the Potato Introduction Station (NRSP-6, Sturgeon Bay, WI) were supplied to researchers at two (2) Canadian institutions including Agriculture and Agri-Food Canada, totalling 97 units

# Utilization of imported nrsp-6 germplasm of material

- Theoretical studies
  - identify plant seeds and parts from archaeological contexts (archaeobotanist)
- Applied research
  - comparative studies
  - Genetic conservation :
    - AAFC Potato Gene Resources - Fredericton
  - Cultivar development :
    - AAFC
    - Private Breeders

# AAFC potato selections release information online at: [www.agr.gc.ca/potato-cultivars](http://www.agr.gc.ca/potato-cultivars)

New cultivars and advanced selections released to industry for commercial evaluation virtually contain one or more wild species in their pedigrees.

- A major focus:
  - resistance to major diseases and pests (including late blight, PVY, PLRV, *Verticillium* wilt, blackleg and the Colorado potato beetle)
  - cold-induced sweetening resistance into parental lines and adapted cultivars.
- Example: Utilization of *S. oplocense* as a source of CPB resistance breeding

**AR2016-04 (F11009) (98.45.1 x 15315-05)-French fry,  
Fresh Market**

*Long, blocky selection with light russet skin and light yellow flesh; high yield; good French fry, boil and bake scores;*



In challenge tests with high levels of Colorado Potato Beetle pressure in field tests in 2013 and 2014, defoliation was 71 and 43% compared to Russet Burbank at 93 and 82 % respectively.

**AR2016-08 (F11017) (Chipie x 15332-02)**

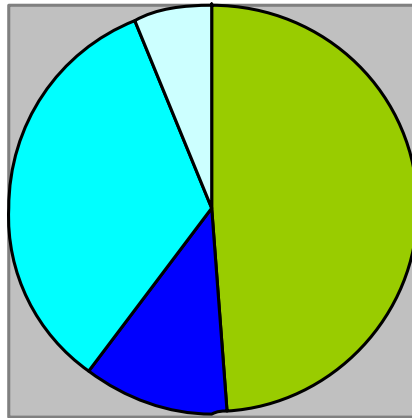
**Fresh Market, Chip**

*Uniform, round to oval selection with buff skin and light yellow flesh; good boil and moderate chip scores;*



In challenge tests with high levels of Colorado potato beetle pressure in field tests in 2013 and 2014, defoliation was 76 and 51% compared to Russet Burbank at 93% and 82 % respectively.

# Agriculture and Agri-Food Canada's Potato Gene Resources Collection



- Heritage Variety (49%)
- Disease Check (12%)
- Canadian Bred (33%)
- Breeding Line (6%)



# Agriculture and Agri-Food Canada's Potato Gene Resources Collection

- “**Prince Albert**” has been grown in the Maitland area (NS) since the 1830s and its survival is thanks to the preservation efforts of local citizens.
- “**Likely**”, donated by the Crop Climate Project in Trail, BC.
- Twenty-two requests for 546 clones were received in 2015.
- Newsletter available at:  
<http://publications.gc.ca/site/eng/9.504603/publication.html>

**ANNUAL REPORT  
FY 2015**

**NRSP-6: UNITED STATES POTATO GENE BANK**

Acquisition, Classification, Preservation, Evaluation and Distribution of tuber-bearing *Solanum* Species.

**COOPERATIVE AGENCIES AND PRINCIPAL LEADERS**

**State Agricultural Experimental Stations**

**Representative**

**Technical Representatives**

Southern Region	Secretary (2016)	C. Yencho
Western Region		D. Holm
North Central Region		D. Douches
Northeastern Region	Vice Chair (2016)	W. De Jong

**Administrative Advisors**

Southern Region		C. Nessler
Western Region		L. Curtis
North Central Region	Lead AA	R. Lindroth
Northeastern Region		E. Ashworth

**United States Department of Agriculture**

**ARS**

Technical Representative	Chair (2016)	R. Novy
National Program Staff		P. Bretting
		G. Wisler
Midwest Area		R. Matteri & P. Simon

**NIFA**

A. M. Thro

**APHIS**

J. Abad

**NRSP-6 Project Leader**

J. Bamberg

**Agriculture & Agrifood Canada**

B. Bizimungu

## **PERSONNEL CHANGES**

Chuck Brown, USDA/ARS technical rep stepped down after 16 years on the committee. He was thanked for his service in a resolution in the NRSP-6 TAC minutes of the June 23-24 TAC meeting at Sturgeon Bay, and awarded a plaque at the meeting of the Breeding and Genetics section of the Potato Association of America on July 20 at Portland Maine. R. Novy, USDA/ARS of Aberdeen, ID is the new ARS technical rep.

## **PROGRESS AND PRINCIPAL ACCOMPLISHMENTS**

### **A. Acquisitions and associated work**

In 2015, we collected 17 germplasm accessions from Arizona, with the support of K. Williams of the USDA Plant Exploration office at Beltsville. Local cooperators joined the Sturgeon Bay team this year. In particular, we began a research collaboration with Utah colleagues seeking to collect for genetic evidence that ancient Native Americans moved potatoes. We found robust populations in places never previously reported: Near the Grand Canyon for *S. jamesii*, and at the northwest limit of the range along the Mogollon Rim for *S. fendleri*. A detailed trip report is available on request and on GRIN. We also sought and received 3 new clones of adapted breeding stocks from cooperators (LUMPERS, CIKLAMEN and RH89-039-16).



New collecting partner anthropologist Lisbeth Louderback (center) joins genebank collectors John Bamberg, Alfonso del Rio, Charles Fernandez and Ingrid Bamberg at an *S. jamesii* site near the Grand Canyon, Sept 18, 2015.

Two manuscripts were prepared describing the accumulation of genetic diversity resulting from 25 years of intensive collecting in the southwest USA, and the composition of core collections of these species, including the discovery of a "mega population"-- a single location that contains most of the total genetic diversity known in the region.

The NRSP-6 web page (<http://www.ars-grin.gov/nr6>) was updated to include all new stocks and screening information. Clients who have ordered from NRSP-6 within the past four years were contacted three times in 2015, informing them of new stocks of true seed, tubers, *in vitro* plantlets, or other samples. We used email and the website to extend technical instructions of various types.



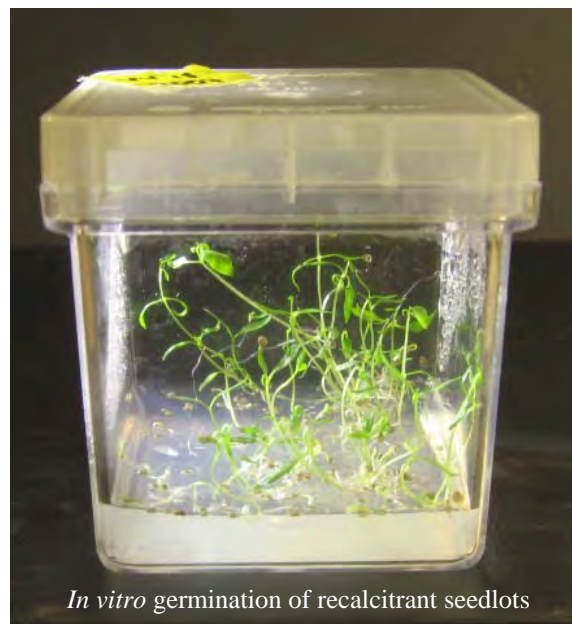
mega-population at Mesa Verde, CO

## **B. Classification**

Dr. Spooner continued work on monographs that will fully document the taxonomic reduction of the genebank's holdings to about 100 species. Taxonomic status was assessed on all stocks grown. This year we started planning a project to grow a sprig from each accession for a color scan to attach to the GRIN record. A tentative plan to move the PTIS herbarium to UW-Madison has also been made.

**C. Preservation and Evaluation.** About 4,000 individual field plots, greenhouse and screenhouse growouts were done locally and at the HARS research farm at Hancock, WI.

1. Propagation: In 2015, 231 accessions were increased as botanical seed populations and 2928 clonally (based on 976 *in vitro* clones being transferred three times each).
2. Germplasm health monitoring: We did 756 PSTV tests, 380 PVX tests, and had Agdia test 105 clones for the six common potato viruses.
3. Characterization: We did 1532 germination tests, 26 ploidy evaluations and 33 tetrazolium seed viability assays. We demonstrated that some seedlots that have very low germination by conventional methods are actually highly viable if germination is nursed *in vitro*.



*In vitro* germination of recalcitrant seedlots

#### 4. Evaluation and Technology:

Hybrid technology: With Kemin (IA) cooperators, we created exotic hybrids only possible by embryo culture, and tested novel interspecific families with the ability to self, thereby making populations with full segregation for detecting QTLs for marker-assisted selection mapping.



Peru connection: With Peru cooperator J. Arcos and J. Palta of UW, made crosses of various elites for wart, drought, frost, late blight, tuber calcium for Puno, a major center of potato production and breeding in Peru. Puno is also a place with widespread and regular production challenges (especially frost, as shown at right).



Heat stress: With ARS cooperators in Parlier, CA, re-screened 2014 selected tolerant clones.

Egg-yolk specialty potatoes: With cooperators Curzio C. of Seedsavers, D. & I. Douglass and L. Zotarelli of UF, K. Haynes of ARS Beltsville, R. Lozano UMN, D. Holm of CSU, and T. Wagner of WA, replicated field grow-out of all orange flesh *Criolla* cultivar prospects we and others selected; continued field evaluation of elites, taste tests, recurrent selection. Although not the classic Colombian form, a red skinned Criolla might have particular appeal in the USA, and Peruvians also consider this combination attractive.



Protein: With Simplot cooperator initiated high protein screening project.

Genotyping genebank holdings: With Frito Lay initiated GBS of 700 cultivars and breeding stocks and prepared materials for joint work on tuber calcium. With Chinese cooperator initiated GBS of most of the genebank wild species accessions. With MSU and CIP cooperators initiated SNP genotyping of most genebank named cultivars. This promises to be a tremendous tool to show us hot spots of genetic diversity (core collections), which should lead to more efficient collecting, preservation, and evaluation of germplasm.

Core collections and other intra-specific groupings: With MSU cooperator screened all species *S. demissum* pops for late blight and started AFLP characterization. Started screening species *S. cardiophyllum*, *ehrenbergii*, *commersonii* for tuber traits and DNA markers. With ARS cooperator in WA, wrote paper on power of intuitive visual classification to predict groups within species with similar traits.

Folate and Nematode: With Oregon State cooperators continued evaluation and selection projects for folate improvement and resistance for Colombia Root Knot Nematode.

Remote grow-outs: With UC Davis, conducted remote winter greenhouse tuber grow-out to expand our capacity by using a location that requires less fuel to heat. With potato grower in Hawaii, started winter grow-out tests for advance field evaluation of new (wild x cultivated) species hybrids.

Tuber freezing resistance: Discovered first reported significant tuber freezing survival. If we can dissect the physiology and apply it to other germplasm, it might lead to an efficient long-term germplasm storage tool.



Field tuber adaptation: We discovered how to make large field tubers of *jamesii* and related species which typically have only marble-sized tubers, or none at all in Wisconsin fields. This should allow screening for tuber traits that has previously been possible only in labor and resource-intensive winter greenhouse pot propagation.

Zebra chip: With USDA/WA cooperator made hybrids between *bulbocastanum* clones which were found last year to be highly resistant to psyllids and evaluated all *verrucosum* pops (more breeding friendly), finding two very resistant.

Wart: With Canadian cooperator A. Murphy, tested new *S. ajanhuiri* hybrids in NL.

Using *S. jamesii*: With collaboration of A. Yermishin of Minsk, crossed all available germplasm of *S. verrucosum* with *S. jamesii*, identifying best bridge-species mothers and obtaining the first 6 true *jamesii* hybrids confirmed by SNP analysis in cooperation with D. Douches at MSU.



Potato beer. Explored feasibility, achieving high quality product. Began investigation of enhanced nutritional qualities, economic impact, characteristics of optimal germplasm. Potato beer has exceptional flavor and smoothness. Beer is a major food outlet in the US. If potato captured some of that market, we would make a

significant impact on sub-optimal potassium intake (for example). With the juice of one potato per bottle, exclusive potato beer consumption in the US would require the entire annual potato crop.



#### **D. Distribution**



Distribution of germplasm is at the heart of our service. The volume and types of stocks sent to various consignee categories are summarized in the table below. In 2015, distributions were typical: 211 domestic orders to clients in 34 states and 13 foreign orders to 10 other countries. About 1/3 of the domestic orders are for breeding and genetics, 1/3 for home gardeners, and remainder 1/3 for pathology, physiology, entomology, taxonomy and education.

In 2015 we maintained the popular offering of 100 cultivars as tubers by devising and implementing an iron-clad disease control and quarantine program for their production (full details available at our website). We now only offer tubers of wild species by special order.

Category	Units of Germplasm Sent <sup>1</sup>						Total	PIs
	Seed	TU	IV	DNA	Plants	Herb		
Domestic	2101	2918	1846	1203	2721	0	10789	6405
Foreign	312	44	247	0	0	0	603	412
Total	2413	2962	2093	1203	2721	0	11392	6817

<sup>1</sup> Types of stocks sent/(number of seeds, tubers or plantlets per standard shipping unit): Seed = True Seeds/(50), TU = Tuber Clones/(3), IV = *in vitro*/(3), DNA = dried leaf or tuber samples/(1), Plants = Rooted Cuttings/(1), Herb = Herbarium Specimens/(1).

## **E. Outreach**

Trip to Peru in March solidified program for cooperative activities in Puno. Met with FAS, INIA, CIP, and NGOs who are interested in participating in comprehensive germplasm evaluation and development on the Altiplano.

Hosted NRSP-6 TAC meeting. Chaired Potato CGC and AJPR Editorial Board meetings.

Volunteered presentations with published abstracts: Four at PAA in Portland, ME plus one at PAG in San Diego. Invited presentation with published abstract: Society for *In Vitro* Biology conference on June 3 in Tucson. Accepted full paper in *In Vitro Cellular & Developmental Biology – Plants* with M. Martin (UW), J. Abad (APHIS), M. Jenderek and J. Tanner (ARS, CO), D. Donnelly (McGill, Canada), AMK Nassar (Egypt), R. Veilleux (Virginia PI), R. Novy (ARS ID).

Badger Common Tater feature story on the Genebank 67(11) p. 20-25.

Hired and managed three undergrad students as summer interns with research projects.

Maintained all US potato germplasm records in GRIN.

All germplasm documentation, and details about technology, outreach, and staff publications is available at our website: <http://www.ars-grin.gov/nr6/>.

## **IMPACT STATEMENT**

In 2015, seed increase success and distributions were steady, supporting the needs of the nation and world for resources to genetically improve the potato crop.

As the most consumed and most valuable US vegetable, potato substantially influences the farm economy and environment in many states. High value-added processing and high and regular consumption gives potato significant impact in all states with respect to the food economy and citizens' health.

Because potato has more useful exotic germplasm than any other crop, there is much activity in federal, state, and private breeding and research programs using genebank stocks. Potato is a high input crop with many opportunities for improvement that can be addressed by germplasm. Potato is a prohibited import crop, so genetic resources already in the US genebank are the only ones readily available to US germplasm users. Continuing restrictions on international germplasm collecting and sharing make what we already have at NRSP6 even more precious. NRSP6 is the premier potato genebank in the world, and the only program in the nation responsible for providing these potato genebank services.

The payoff in funding the genebank is in discovering and deploying traits that are useful to the public and the industry. We participated in successful selection of better stocks for golden flesh, frost resistance in Peruvian highlands, folate, potassium, resistance to tuber greening, glycoalkaloids, and a natural appetite suppressing protein. New cultivars and releases published this year: Germplasm releases for Early blight resistance, Sierra Rose, and Peter Wilcox. They all have NRSP6 exotic germplasm in their pedigrees, including species *S. andigena*, *phureja*, *stenotomum*, *palustre*, *bulbocastanum*, *stoloniferum*, *edinense*.

Salary and travel support plus cash gifts from industry totaled over \$45K in 2015.

The ability to efficiently evaluate traits is rapidly improving. We are on the brink of a leap forward in breeding through molecular markers and genetic technology. Potato is an increasingly important world food. Climate is changing, and health issues and their economic impact are increasing in our aging population. Because of these factors, there has never been a more important (or exciting) time to be involved in improving potato through mining the rich deposits of traits in the US Potato Genebank.

### **WORK PLANS / STAFF & FUNDING / ADMINISTRATION**

In FY16, we plan to continue the service program to acquire, preserve, classify, and promptly distribute high quality germplasm and data to all requesters. We will endeavor to say "yes" to requests for custom service and advice whenever we are able.

We plan to continue to build our program in the area of genetic diversity management research (making use of the new, more powerful DNA markers now available), collecting research (predicting sites likely threatened by climate change), and benefit sharing collaborations with Andean germplasm donor countries (in particular, the successful frost, drought, wart, tuber calcium breeding effort in Puno).

We expect to continue participation in "teaching" activities by hiring summer student interns who learn about potato science and help us explore promising new research and technology ideas. This has resulted in students participating in germplasm collecting, formal presentations at PAA, and authorship on peer reviewed publications. Keeping current with potato science and rapport with scientists will be maintained by service as editor of *American Journal of Potato Research*, and participation in the Potato Association of America.

We expect to continue the service to industry partners that has been attracting their strong support, and similarly maintain strong ties with our sister genebanks around the world.

We intend to seek opportunities to evaluate and deploy germplasm in ways that impact the consumer, notably with respect to nutritional traits, thus enhancing the reputation, demand, and positive health and economic impact of the potato crop on society.

We expect to continue and expand approaches to evaluation and technology that multiply information gathering:

1. Multiple data collection schemes for a single grow-out, or "multiplex" testing.
2. Synergistic cooperation with specialists in various disciplines, and Latin American projects for benefit sharing and developing systems for testing germplasm that mitigates impact of climate change.
3. Testing for links between easily assessed traits and more difficult traits.
4. Making use of our *in vitro* facilities and expertise to investigate microbial bioassays and selecting agents.
5. Characterizing visual (cog), genetic, geographic, and trait differences within species as predictors of germplasm application.



6. DNA-based tests for assessing genetic diversity with respect to collecting and preservation techniques, and climate change.
7. Exploring use of CETS phytotrons to allow precise and controlled generation of wild species tubers for efficient screening, and propagation of cultivars for evaluation for production in different environments.

## **PUBLICATIONS**

Many other scientists are publishing research that directly or indirectly originated from NRSP6 stocks. Publications that mention potato species (both old and new taxonomy) are likely to have such a connection to USPG germplasm and service. The search below produced hits which the reader can regenerate independently, or which can be accessed through our website: <http://www.ars-grin.gov/nr6>.

Staff publications (for 2014 and previous) which give details on the initiatives summarized above can be readily accessed through the personnel links for Bamberg, Spooner, and Jansky at the genebank website.

The search below does not catch cultivars, breeding stocks and genetic stocks, which have some 900 particular names to search, or are *tuberosum* and therefore more likely to be of independent origin. Note that even when the publication is of foreign origin, and the researcher probably received materials from another genebank, that foreign genebank may have originally received those materials from USPG. Since potato research and breeding is a slow process, materials published in 2014 could, of course, have been ordered many years previously. Similarly, these articles may only cite previous work with exotic species as related background information published by others, not because they were the materials used in the present experiment.

Digitop > browse by type: Databases > AGRICOLA > (log in) > cut and paste string below into "simple search" box > click "go"

### **This hits records in Agricola or CAB abstracts: 172 hits from this query in Agricola for CY2015**

Solanum and (abancayense or acaule or achacachense or acroglossum or acroscopicum or aemulans or agrimonifolium or ajanhuiri or alandiae or albicans or albornozii or ambosinum or andreanum or arnezii or astleyi or avilesii or aymaraesense or berthaultii or blanco-galdosii or boliviense or brachistotrichum or brachycarpum or brevicale or buesii or bukasovii or bulbocastanum or burkartii or cajamarquense or canasense or candolleum or capsicibaccatum or cardiophyllum or chacoense or chancayense or chilliasense or chillonanum or chiquidenum or chomatophilum or circaeifolium or clarum or coelestipetalum or colombianum or commersonii or contumazaense or curtilobum or demissum or doddsii or dolichocremastrum or edinense or edinense or ehrenbergii or etuberosum or fendleri or fernandezianum or flahaultii or gandarillasii or garcia-barrigae or gourlayi or guerreroense or hintonii or hjertingii or hondelmannii or hoopesii or hougasii or huancabambense or hypacrarthrum or immite or incamayoense or infundibuliforme or iopetalum or irosinum or jamesii or juzepczukii or kurtzianum or laxissimum or leptophyes or leptosepalum or lesteri or lignicaule or limbaniense or lobbianum or longiconicum or macropilosum or maglia or malmeanum or marinasense or matehualae or medians or megistacrolobum or michoacanum or microdontum or minutifoliolum or mochiquense or morelliforme or moscopanum or multidissectum or multiinterruptum or nayaritense or neocardenasii or neorossii or neovalenzuelae or okadae or oplocense or orocense or orophilum or otites or oxycarpum or palustre or pampasense or papita or paramoense or pascoense or paucijugum or paucisectum or phureja or pinnatisectum or piurae or polyadenium or polytrichon or raphanifolium or rechei or sambucinum or sanctae-rosae or sandemanii or santolallae or scabrifolium or schenckii or soestii or sogarandinum or solisii or sparsipilum or spegazzinii or stenophyllidium or stoloniferum or subpanduratum or sucrense or sucubunense or tarijense or tarnii or trifidum or tundalomense or tuquerrense or ugentii or velardei or venturii or vernei or verrucosum or violaceimarmoratum or weberbaueri or yungasense or goniocalyx or stenotomum or andigenum or andigena or (USDA and "Solanum tuberosum")) (doc-type:Articles or doc-type:Books) pub-year:2014

# NRSP-6 TAC Meeting 2016

## Interim report

Summary of FY 2015 Annual Report and activities since October  
(snapshots of new and continuing activities at the genebank)

# Germplasm orders are up

+26% so far this year!



# Ornamental from artificial tetraploid *commersonii*

- self seed propagating
- will try for 8x with even bigger flowers



4x cm about 3x size of normal wild species flowers

Normal wild species

Henry DeJong's  
diploid breeding  
stocks imported



# Continue Colombian *Criolla* work

*“Egg Yolk” Style Potatoes available and adapted in the USA*

*--taste tests in 2015 and creating inbred lines--*



## POTATO TASTE TEST RESULTS 11/29/2015

Place	Potato Type	Total Rank Points
1	Skagit Valley	15
2	Criolla #8R+	16
3	Criolla #5	18
3	Criolla #12	18
5	Criolla #9	24
6	Yukon Gold	35
7	Criolla #9	40
8	Skagit - Curzio Caravati	45

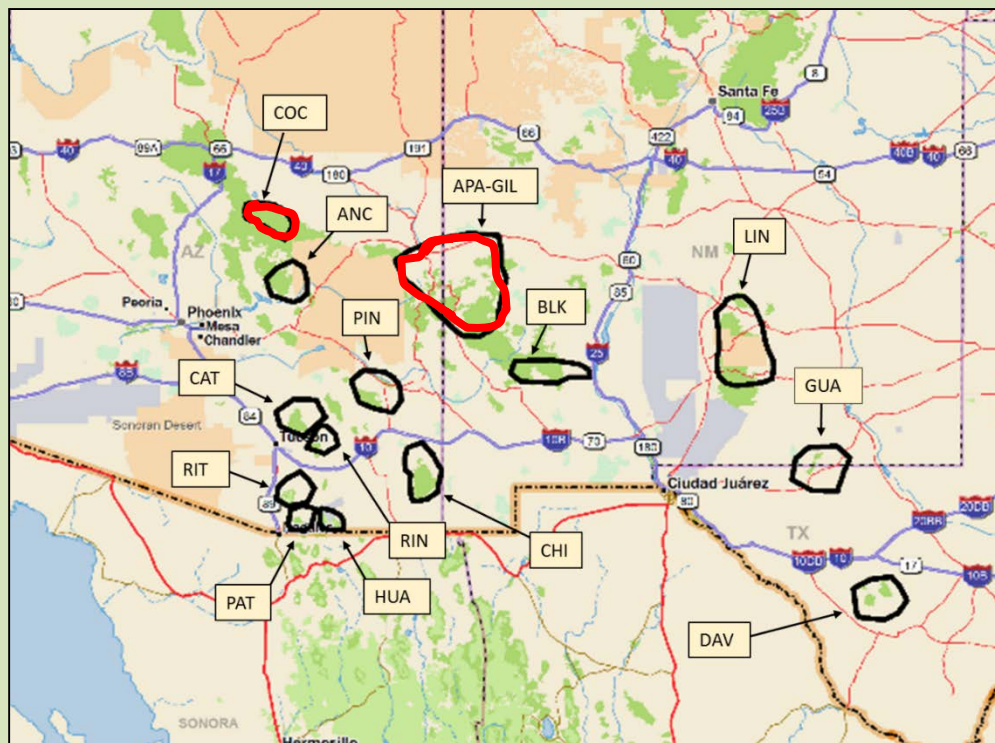


SB selection: #5

# Discovering genetic diversity “hot-spots” in the USA

John and Ingrid Bamberg, Alfonso del Rio, "Chico" Fernandez, Kirstin Olmon Phillips, Lisbeth Louderback, Bruce Pavlik

**“APA-GIL”** region for fen  
(new range-extending collections found at **“COC”**)



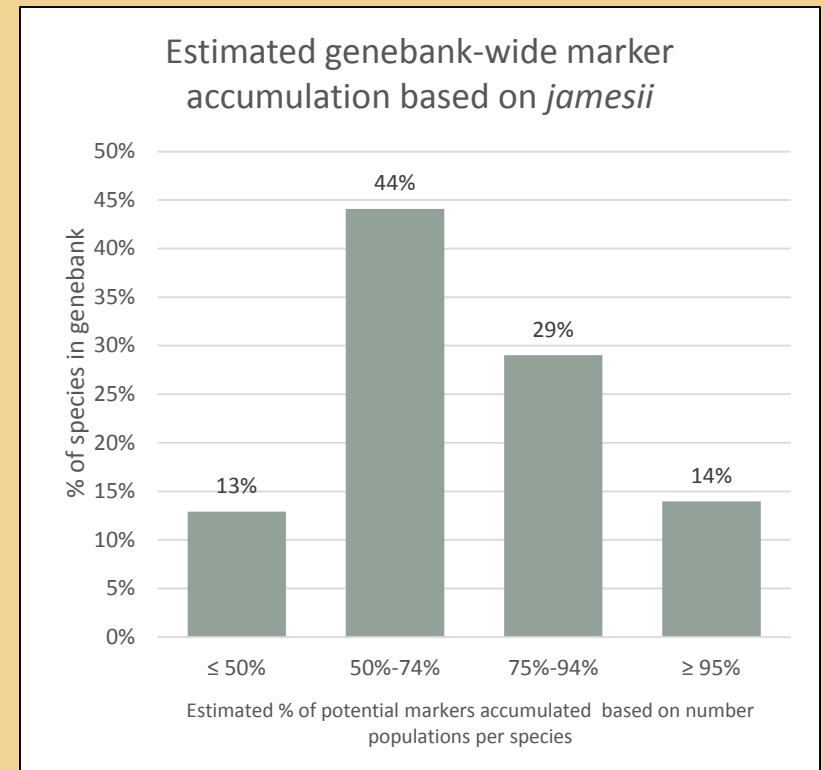
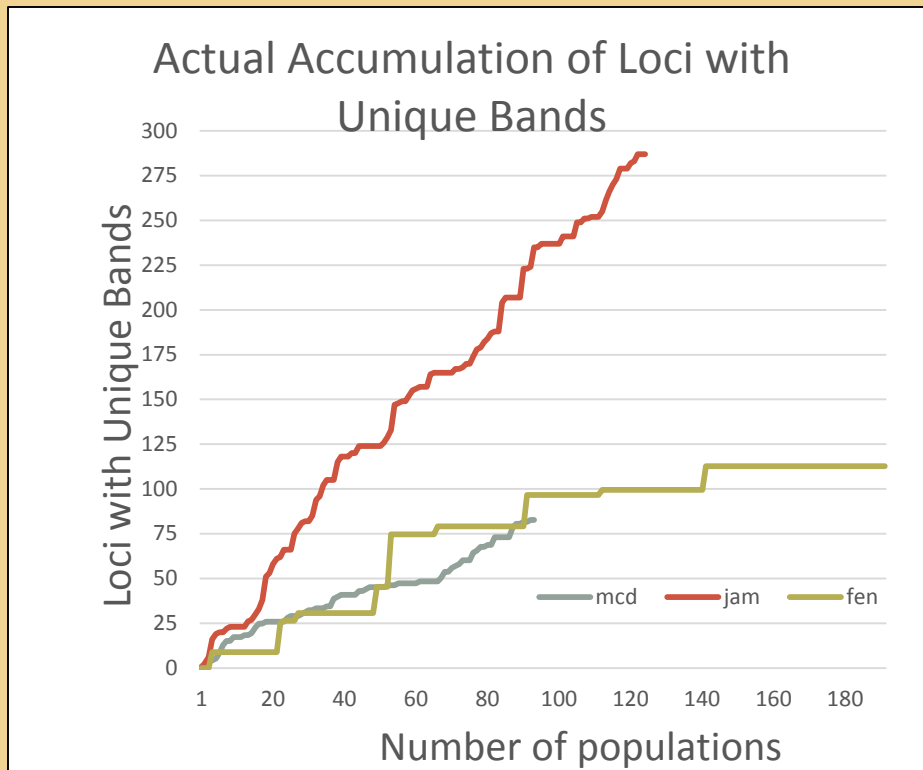
Mesa Verde  
“Mega-population” for jam

Anthropologists join us as collecting and research partners in 2015



# Accumulation of diversity

*how much is enough?*





# SCAN project

we got a large scanner  
(as big as an herbarium sheet)



- Relatively easy to make beautiful scans instead of herbarium specs
- Can be observed without any grow-outs or physical shuffling
- Can be attached to accession records in GRIN
- Can be used to facilitate impartial COG trials (visual core) by anyone in the world with a computer

# Big Tuber Wild species

- We would like big field tubers for evaluation
- *tuberosum* nobilizing parents are hard to develop
- *tuberosum* hybrids are often sterile dead ends
- We have early, big tuber crossing mates for 1EBN and LON species
- Could be use to find markers for tuberization



# Zebra Chip psyllid resistance discovered...

*With Rodney Cooper, ARS-Wapato*

*Making breeding stocks and segregating marker pops*

**STRONG** resistance in the wild potato species

*Solanum verrucosum*



*insect vector*



*unmarketable chips*

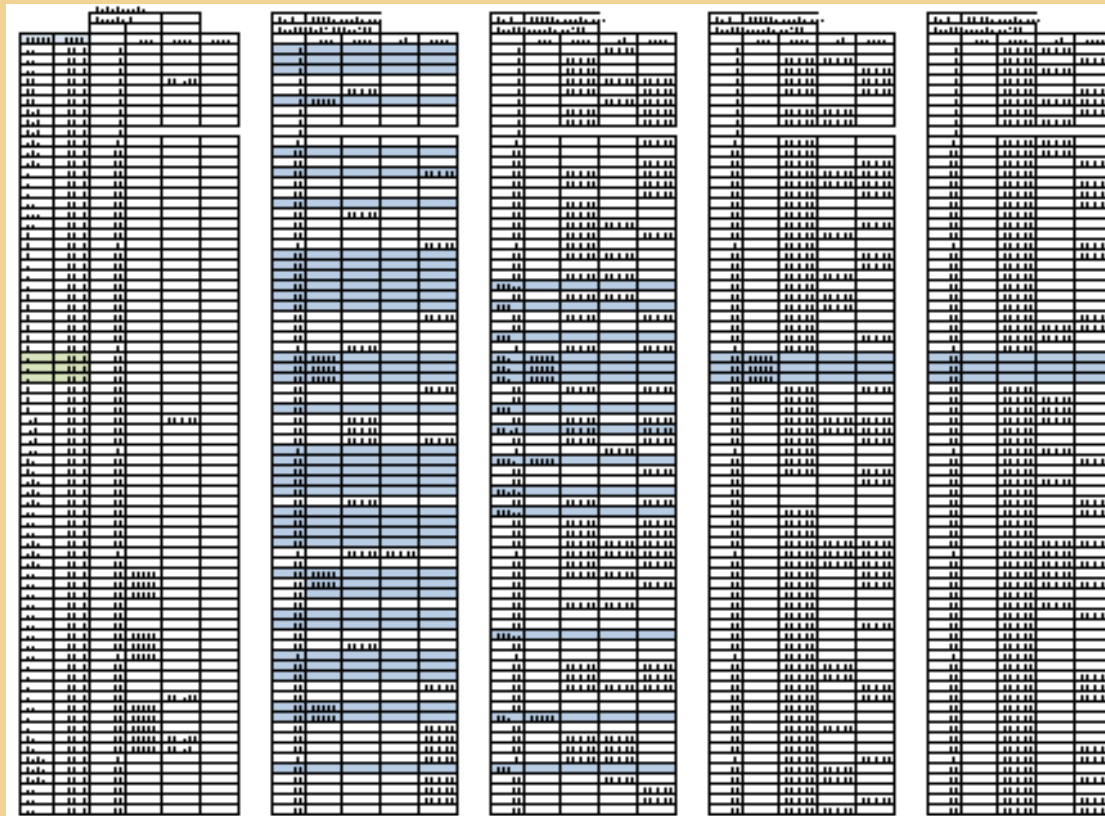
# Fatty acid profiles on seeds

- Free cooperation with Bob Jarret from S9 in Georgia
- Ultimate ease of evaluation-- without having to even sprout the seeds
- Preliminary: more 18:2 in some species seeds is due to freeze tolerance needed in the wild?



# Freezing tolerance in *S. jamesii* tubers!

The only survivor to -4C of 75 pops of 25 species



Control

-1 C

-2 C

-3 C

-4 C

... along with high late blight, insect and nematode resistance, probably drought resistance, very high antioxidants and dry matter, extreme tuber dormancy, and low pH tubers with anticancer properties in this species

# Germplasm benefits shared in Peru...



## Frost, drought, wart, and calcium breeding in Puno\*

*--with Jiwan Palta, Alfonso del Rio, and CETS and Peruvian cooperators*

CETS machines work well for Peruvian native cultivars



\*and beer!

