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NRSP-6 TAC 2012 MINUTES

NRSP6 TAC meeting hosted by Texas A&M University, College Station, TX
April 17-18, 2012

Creighton Miller, Chair, NRSP-6 TAC '12
David Holm, Vice-Chair, NRSP-6 TAC '12
Walter De Jong, Acting Secretary, NRSP-6 TAC '12

The meeting was called to order by Chair Miller at 8:30 a.m.

ATTENDANCE

Present: Richard L. Lindroth, John Bamberg, Walter De Jong, Michelle Krucker, David Holm, Creighton Miller, Sarah Turner, Charles Brown, Craig Nessler, Jeff Koym and Douglas Scheuring.

On Conference Call: Peter Bretting, Benoit Bizimungu, David Spooner, Larry Chandler, Shelley Jansky, Gail Wisler

The meeting started with a welcome by Dr. Mark Hussey, Dean of the College of Agriculture and Life Sciences at TAMU. Hussey provided an overview of the college:

- It serves 7000 students, largest CALS in the nation
- Unlike most other CALS nationwide, which have been experiencing severe cuts, budget at TAMU has been fairly stable. Took a 12-15% cut last year, but expect level funding going forward

BUSINESS

Preliminaries

1. **There were no announcements**
2. **Minutes of the 2011 meeting were circulated, and approved unanimously.**
3. **There were no additions to agenda**
4. **Chair appointed Resolutions Committee: Brown and Nessler**

5. **Lead AA:**

Rick Lindroth, the Lead AA and Associate Dean of CALS at UW-Madison, summarized recent changes at UW and impact they would have on the potato genebank:

a) There is a new Dean of CALS in Madison (Kathryn VandenBosch). She has initiated development of a new strategic plan for the college, to be completed before any restructuring occurs. Last year, CALS took a 17% budget cut. 28 (out

of 250) faculty in the college retired last year. Expect to be able to replace only four of the 28 in 2012.

b) When restructuring occurs, Peninsular Ag Research Station might close. Closing is not a given, but is one of multiple budget-cutting measures that will be considered.
c) At present, USDA-ARS is not prepared to transition genebank funding away from off-the-top hatch funding (i.e. NRSP-6)
d) NRSP steering committee understands that potato genebank funding is unique (compared to other genebanks). It would like potato genebank to continue to make good-faith attempts to secure industry funding, as it has been doing the past few years. At this opportune moment - Michelle Krucker, a representative from Simplot – publicly announced that Simplot will donate 20K per year to the potato genebank.

Miller asked: if Peninsular Research Station closes, what would USDA-ARS do?

Larry Chandler response: USDA would work with UW to find a home for the potato genebank, wherever that might be. Bamberg added that all potato genebank employees are currently paid by USDA; UW no longer pays salary for any.

Craig Nessler noted that he served on the NRSP steering committee several years ago. Back then, there was concern about whether there was any industry buy-in for NRSP-6. The NRSP committee is unlikely to provide long-term funding for any NRSP without industry backing. That said – Nessler's view is that the potato genebank should be funded by the federal government, as a matter of national food security. The next time NRSP-6 goes up for renewal, Nessler recommends that a few industry letters be included with the documentation.

6. Other regional AAs

None present.

7. Regional and ARS Technical Reports

Reports from David Holm, Creighton Miller, David Douches and Walter De Jong summarized usage of NRSP-6 germplasm for Western, Southern, Central and Northeastern regions, respectively, in 2011.

Local host Miller gave a powerpoint presentation overview of his breeding program. Texas has a large temperature gradient (north to south) and rainfall gradient (west to east), so the environment across the state is not uniform. From his base in College Station, it is 350 miles to his Weslaco trial site, 400 miles to Springlake, and 700 miles to Dalhart. Bottom line: lots of driving. He has an annual field day; about 50 people attend each year. Has recently been screening clones (~600) for tolerance to Zebra Chip symptoms.

Sarah Turner, graduate student of Miller, gave a short presentation on her MS research titled Effects of Bioactive Compounds From Different Potato Genotypes on Prostate Cancer Development in Athymic Nude Mice.

De Jong noted that demand for potato germplams that had been well-characterized with genetic markers, e.g., the SolCAP germplasm panel, was expected to increase with time, as such populations permit investigators to map traits of interest to them without having to do any genotyping themselves. De Jong moved that potato genebank maintain approximately 250 genotyped potato clones (~ SolCAP germplasm panel) as a long-term resource for the breeding/genetics community. Motion passed unanimously.

Charles Brown distributed a report summarizing usage by USDA scientists. He has been working to develop high carotenoid tetraploid potatoes, using markers to identify clones with desired (recessive) zeaxanthin epoxidase allele. He now has 60 clones homozygous for this allele; they are high in zeaxanthin, and fry to a golden color without added sugar. Chuck is also looking for Solanum species that can serve as trap crops for potato cyst nematodes. Shelley Jansky has been looking for new PVY resistance genes. Found PVY resistance more prevalent in low-altitude species - perhaps aphids don't reach high altitudes, so resistance not needed? Shelley has also published some work on breaking dormancy in seed, has released some germplasm with an "M" designation for Madison, e.g. M7, a long russet that arose from bilateral sexual polyploidization, and M6, a chacoense line that has been selfed seven times, and is 90% homozygous for SolCAP SNPs.

8. AAFC Report

Benoit Bizimungu reported that AAFC will be restructuring, with the research branch merging with a yet-to-be-defined entity effective on July 1. The A-base funding that supports potato breeding was renewed last year and will continue for several more years regardless. Focus of current project is disease resistance/pesticide reduction. Using pinnatisectum/chacoense/other species to achieve this. Released four new varieties last year, all have NRSP-6 germplasm in them.

9. **Industry perspective**

Michele Krucker: Simplot is on track to commercialize several intragenic varieties, with reduced bruise, reduced acrylamide, and reduced cold sweetening.

10. NRSP-6 Annual Report

John Bamberg distributed a written report, and highlighted the following:

a) Acquisition. He collected at new and old sites within USA last year. Old sites were known, based on molecular marker analyses, to be hot beds of diversity. Genebank also imported new clones from Spain, Columbia, Canada, and Peru.
b) Preservation and Evaluation. Conducted many germination tests, and increased about 200 seed populations (routine activities at genebank). Wisconsin updated the greenhouses, which allows for better control of environment, and fruit set has improved as a result. Has been working with Aymeric Goyer to screen germplams for folate levels: some bolivense accessions are good sources. Study of tuber greening under light in microdontum has shown the trait to be highly heritable. A study of allergenicity in potato was recently initiated.
c) Classification. David Spooner reported that section Petota had 230 species when he began working 25 years ago; he has suggested, through a series of monographs, that the number should actually be reduced, to about 100 species. Spooner has also been testing value of taxonomy to predict disease resistance, using soft-rot as a test case.
d) Distribution. The genebank distributed 6977 units of germplasm in 2011, spread across 197 domestic and 20 foreign requests. About half were for breeding/genetics, a quarter were for pathology, and a quarter for home gardeners.
e) Staff reductions. Have lost ½ a position due to cuts.

Discussion of Tuber Distribution Policy. The genebank has been distributing tubers for the past several years. In the distant past, they did not, for fear of spreading disease. Should tuber distribution continue? Consensus of those present: yes, but make clear to recipients how tubers were produced. Formalize procedures for producing the tubers. Include a disclaimer with tubers sent out. Larry Chandler asked that a draft of the proposed policy be sent to National Program Staff for review.

Discussion of tuber import/discard policy. The technical committee has previously given Bamberg discretion to discard, or import any germplasm he deems appropriate. Would we like this to continue? Consensus: yes, but genebank should send out an email before discarding anything, giving users one year to request material before it disappears.

11. Collecting and taxonomy

David Spooner published "Taxonomy of Cultivated Potatoes" in 2011, which renames many cultivated potato species.

12. USDA/ARS administration

Peter Bretting: USDA budget was reduced 3.3% in FY2012, which led to some closures, especially in Alaska. Specific Cooperative Agreements were cut as a result, too. FY2013 budget – outlook unclear.
Gail Wisler: National Potato Council time-zone grant budget was cut about 30% this year.

13. APHIS/Quarantine report

Jorge Abad's written report was distributed.

14. Resolutions:

Resolutions were made thanking host JC Miller for excellent accommodations for the meeting, and for completing 25 years of service as the Southern Region Technical Representative for NRSP6.

15. Elect new officers and set next meeting location

Officers	
Chair:	David Holm
Vice-Chair:	David Douches
Secretary:	Charles Brown

Next Meeting Venue (2013, date to be determined) = Sturgeon Bay

Respectfully Submitted,

Walter De Jong

NRSP-6 Meeting Tentative Agenda

College Station, TX
April 17th-18th, 2012

MONDAY, APRIL 16th

Try to arrive by 6 pm.
6:00-7:30: Wine and cheese at Miller's home
7:30-8:30: Dinner at local restaurant

TUESDAY, APRIL 17th

8:00: Vans will pick up participants at motel
8:30: Welcome (Dean Mark Hussey and Director Craig Nessler)
8:45-11:30: NRSP-6 business
11:30-1:30: Lunch at University Club
1:30-3:45: NRSP-6 business
4:30-6:30: Private tour of George Bush Presidential Library & Museum (Patricia Burchfield, Deputy Director)
7:00-9:00: Dinner at Christopher's

WEDNESDAY, APRIL 18th

8:00: Vans will pick up participants at motel
8:15-9:15: Brief NRSP-6 business meeting and possibly tour of Borlaug Center
9:15-10:00: USDA Cotton Gene Bank Tour (Richard Percy and James Frelichowski)
10:00-10:30: Transport to USDA Pecan Gene Bank Facility
10:30-11:30: Tour and Presentation – USDA Pecan Breeding Program (Tommy Thompson, Research Geneticist, and Larry Grauke, Research Horticulturalist)
11:30: Return to campus via airport (drop off participants with ca. 12:00 flights)

NRSP6 TAC 2012 BUSINESS MEETING TOPICS

Preliminaries

1. Welcome, introductions, misc. announcements, distribution of documents
2. Approve, add to, schedule and prioritize agenda items
3. Review of 2011 minutes
4. Chair Miller appoints Resolutions Committee

Reports and Action (*) items

5. Lead AA
6. Other regional AAs
7. Regional and ARS Tech Reps
8. Agriculture and Agrifood Canada
9. Industry perspective
10. NRSP6 Annual Report and agenda items (Bamberg)

    * Tuber distribution policy in light of disease considerations (see attached)

11 Collecting and taxonomy (Spooner)
12. USDA, ARS admin (Bretting, Wisler)
13. NIFA
14. APHIS/Quarantine (Abad)
15. *Review and approve resolutions
16 *Elect new officers and set next meeting venue

Production Method of NRSP-6 Yearly Tuber Offerings

By M. Martin

Every year NRSP-6 offers approximately 120 different varietal tubers to our clientele for planting. We have offered this service since 2005, and it is very popular. Over the last 8 years we have never had a compliant of disease in the over 8000 plus distributions we have made of these tubers.

The purpose of this discourse is to make you aware of the method by which these tubers are produced, the disclaimer that accompanies the tubers, and to be sure that you, as our technical advisors, feel the precautions and methods we are using are adequate.

These varietal tubers are produced from either in vitro plants or tubers. Of the 120 varieties offered each year, roughly 40 varieties are from tissue-cultured plants, 40 varieties are from tubers that were from tissue-cultured plants one year earlier, and 40 varieties are from tubers that were from tissue-cultured plants two years earlier. This enables us to offer a variety for three consecutive years and then replace it with a new variety from the tissue culture collection.

In vitro material used to produce the varietal tubers is tested free of viruses, PSTVd and BRR. The tubers are produced on plants isolated in an insect-controlled greenhouse, on benches, and in sterilized clay pots containing commercial soilless mix.

Below is the disclaimer (printed on bright yellow paper) that is attached to every packing slip that has varietal tubers.

DISCLAIMER

These tubers were produced on plants isolated in an insect-controlled greenhouse on benches, in sterilized clay pots containing commercial soilless mix, and originating from in vitro material which tested free of viruses. However, they are not guaranteed disease free. We recommend that the most appropriate use of these tubers is destructive testing or one-year field growouts which you are confident would present no risk to your program. Otherwise, retest the tuber material for pathogens that are of concern to your program. <u>You assume any added risk these tubers present as an alternative to ordering the corresponding *in vitro* forms</u>.

The greenhouse spray program was not done with a food crop in mind, so these tubers are...

NOT FOR HUMAN CONSUMPTION

Appendix A

SANITATION AND DISEASE TESTING TECHNIQUES

Three main types of tuber-bearing Solanum materials are distributed: true seeds, tuber families, and in vitro clonal stocks.

True seeds are produced in the greenhouse during the months of January-May. The work area is first disinfected with bleach. Evaluation for PSTV is done by combining a tissue sample from each of the twenty parent plants of each family into a composite and testing by the dot-blot method. When confirmed free of PSTV, the seedlings are planted into sterile soil which has been treated with a systemic insecticide. Additionally, each family is examined and any unusual-looking plants are discarded. The plants are sprayed throughout their life cycle with recommended fungicides and insecticides. Resulting seeds are tested again for PSTV before distribution.

Tuber families are produced on plants reared directly from true seeds between the months of September and January. Evaluation for PSTV is done by combining a tissue sample from each of the twenty seedlings of each family into a composite and testing by the dot-blot method. When confirmed free of PSTV, the seedlings are planted into sterile soil which has been treated with a systemic insecticide. Additionally, each family is examined and any unusual-looking plants are discarded. The plants are sprayed throughout their life cycle with recommended insecticides and fungicides. Tubers produced are thoroughly washed and packaged in new paper bags for distribution.

All clonal in vitro stocks distributed have been tested for virus X, S, Y, M, A, and leaf roll by Elisa, and PSTV by dot-blot tests. Unless otherwise arranged and indicated, all in vitro stocks distributed have tested free of these pathogens.

Additional details can be obtained by contacting this Station.

Note: B. Plaisted objected to the circled section, saying we could not say they were “free” only tested

TRAVEL and LODGING

College Station is served by Continental out of Houston and American out of Dallas. Often the cost of flying directly into College Station is no more than flights to these two cities. Try to arrive in College Station prior to 6 pm on Monday, April 16th. Both Continental and American have flights out of College Station around noon on Wednesday. We will try to meet people or arrange for the motel to meet incoming flights.

Rooms have been reserved at the TownePlace Suites by Marriott in Bryan/College Station under the code NRSP-6. A cutoff date of April 2nd has been established for this block of rooms. Room reservations can be made online or by contacting Michelle Moore at (979) 393-9121 or michelle.moore@marriott.com. Room rate is $93 per night for one bedroom studio suites and $111 per night for two bedroom suites. The two bedroom suites have doors for privacy into each bedroom if you want to share.

One bedroom:
http://www.marriott.com/hotels/travel/CLLTB?groupCode=NRSNRSA&app=resvlink&fromDate=4/16/12&toDate=4/18/12

Two bedroom:
http://www.marriott.com/hotels/travel/CLLTB?groupCode=NRSNRSB&app=resvlink&fromDate=4/16/12&toDate=4/18/12

ANNUAL REPORT

Calendar Year 2011 with updates through March 2012

NRSP-6: UNITED STATES POTATO GENEBANK

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	Chairman (2012)	J. C. Miller, Jr.
Western Region	Vice-Chair (2012)	D. Holm
North Central Region	Secretary (2012)	D. Douches
Northeastern Region		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	C. Brown
National Program Staff	P. Bretting
	G. Wisler
Midwest Area	L. Chandler & P. Simon
NIFA	A. M. Thro
APHIS	J. Abad
NRSP-6 Project Leader	J. Bamberg

Agriculture & Agrifood Canada

B. Bizimungu

PROGRESS AND PRINCIPAL ACCOMPLISHMENTS

A. Acquisitions and associated work

A genebank team re-collected spots known to be highly diverse in AZ, and found some new, totally unreported robust sites for *jamesii* in NM. The final days were spent collecting the first live *fendleri* from the TNC land in the Davis Mts of west TX, and also rediscovering *jamesii* there. This made 32 new accessions for the genebank. We have been offered to lead an expedition accompanied by a film crew in fall 2012.

S. jamesii near Silver City, NM

A. del Rio toward Mt. Livermore, TNC preserve, Davis Mts., W Texas

Fourteen new clonal stocks were imported-- 10 from Spain, two from Columbia, one from Peru, and one from Canada. Seventeen new populations of *S. microdontum* were added. Two new USA *jamesii* collections were collected and donated by D. Kinder, professor of medical chemistry at Ohio Northern University (anticancer interest). Three named *papa criolla* orange fleshed selections were donated by C. Quiros (CA).

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 2011, informing them of new stocks of true seed, tubers, in vitro plantlets, or herbarium samples.

B. <u>Preservation and Evaluation</u>

We increased 217 seed populations, performed 500 PSTVd tests, 1433 germination tests, 31 ploidy determinations, and 30 tetrazolium seed viability tests. Renovation of the E greenhouse range last fall, along with improved potting techniques and fertilization regime is supporting good seed increases.

Regular need to monitor germination on over 5,000 populations

New greenhouse skin, wiring and controls in fall 2011provides...

... better environment for abundant fruitset

With help of cooperators, we made progress evaluating germplasm in several ways.

We selected orange-fleshed stocks from hybrids of *S. phureja* based on taste, appearance and cooking quality evaluated by a native Colombian (FL) familiar with the ideal for traditional *papa criolla*.

"Golden" project for orange flesh using Colombian *S. phureja*

With A. Goyer (OR), we identified cultivated and wild species with multiple times the folate levels of standard cultivars. We have begun the process of fine screening, and creating hybrids for breeding and MAS. The often inadequate intake of folate impacts a broad range of serious physical *and mental* diseases.

some *S. boliviense* pops exhibit tremendous levels of tuber folate

The cooperative project with Kemin (IA) continued to make surprising gains, this year again nearly doubling the previously highest known concentration of an anti-appetite enzyme in potato tubers.

We continued evaluation of *microdontum*, a species with a remarkable array of useful traits, this year doing work to show that resistance to illuminated tuber greening is highly heritable.

Testing heritability of tuber greening in *S. microdontum* hybrids

In cooperation with C. Brown (WA) we selected yellow-fleshed clones from populations known to have low sugars, which he and colleagues selected for those able to make a processed product not dependent on high-acrylamide frying conditions for acceptable color.

Natural color can result in golden chips without much acrylamide

Work continued with cooperators at the International Potato Center (CIP) at Lima Peru, and J. Palta (WI) to better understand and exploit the great yield and quality increases resulting when some native cultivars are supplied with extra fertilizer calcium.

Cooperative research plots in Peru

We produced tubers on plants selected for high nutrients and antioxidants, to which Titanium or Water sprays had been applied pursuant to testing the effect of Ti “hormesis”.

Short day winter California field plots (Oct – Jan) were tried, resulting in some success in production of field tubers of wild species that do not form at all in the field at Sturgeon Bay.

Some individuals have severe, even life-threatening allergic reaction to uncooked potato protein. We began investigating the potential for testing a

spectrum of germplasm for greater or lesser allergenicity.

The tetraploid, purple-flowered wild potato native to the USA, previously *S. fendleri*, has been lumped with several Mexican species of series Longipedicellata to a single *S. stoloniferum*. When over 400 populations of coded randomized potted plants were physically clustered by only a quick *a priori* impression, groups with high affinity to previously-named *fendleri*, *stoloniferum* and *polytrichon* emerged. We demonstrated that volunteers of widely varying familiarity with potato have no difficulty in making an instant, accurate visual classification, and every population originating from the USA is always identified as the *fendleri* form. Thus, visually perceived differences in these forms that were previously represented as species are not imaginary. The *fendleri* form clearly differs in flowering duration, tuber initiation and yield. We conclude that the tetraploid Longipedicellata of the USA are exclusively of the *fendleri* form, and that the loss of this name reduces practical information by obscuring its distinction from the *stoloniferum* and *polytrichon* forms of Mexico.

USA wild tetraploid populations are all the *fendleri* form, always distinct from their *stoloniferum* and *polytrichon* Mexican relatives

We expanded work on the *Microdontum* Multifaceted Project (MMP) by identifying 1741 informative AFLP loci for help in selecting a core collection. AFLP loci were treated as though they were traits, with the banded condition considered to be the desired state. At least one band unique to a population was present in 45 populations, and these 45 populations together captured 98% of all bands. Adding another 14 populations for a total of 59 captured all bands. This core set was assessed for whether it encompassed those populations known to have useful traits, including nutritional and quality components; and disease, stress and pest resistances. As with AFLP bands, all 25 of the most desirable phenotypic traits were also found in populations in the core set of 59 populations. These

AFLP markers may also reveal the influence of eco-geo parameters, and introgression from other species.

S. microdontum is an ideal candidate species for various types of genebank study

C. Classification

This year David Spooner did research on: 1) a taxonomic monograph of cultivated potato, 2) a test of taxonomic predictivity of potato taxonomy using soft rot as a test case, 3) a test of taxonomic predictivity of potato taxonomy using virus Y as a test case, 4) A DNA-based analysis of taxonomic relationships in the wild potato group *Solanum* series Conicibaccata, 5) a summary of the use of field work for taxonomy, 6) a report of the development of a new technique (SSCP analysis) for separating allelic variants cheaper and more accurately than by cloning, 7) a geographic information systems analysis of the discovery of *Solanum morelliforme* in South America, 8) a summary of taxonomy in *Solanum* series Lycopersicon, the sister group of potato.

D. Distribution

The volume and types of stocks sent to various consignee categories are summarized in the table below. NRSP-6 distributed 197 domestic orders to clients in 34 states of the USA and 20 foreign orders to 12 other countries. About ½ of domestic orders are for breeding and genetics, about ¼ for home gardeners, and the remaining ¼ for pathology, physiology, entomology, taxonomy, educational, etc.

	Units of Germplasm Sent[1]								
Category	Seed	TU	TC	IV	DNA	Plants	Herb	Total	PIs
Domestic	2,001	0	2,636	673	0	513	11	5,834	3,910
Foreign	794	0	0	349	0	0	0	1,143	526
Total	2,795	0	2,636	1,022	0	513	11	6,977	4,436

[1] Types of stocks sent/(number of seeds, tubers or plantlets per standard shipping unit): Seed= True Seeds/(50), TU = Tuber families/(12), TC = Tuber Clones/(3), IV = *in vitro* stocks/(3), DNA = dried leaf samples/(1), Plants = rooted cuttings /(1), Herb= Herbarium specimens/(1).

E. Outreach

See Section 6. for genebank research published on a variety of issues. An agenda brief on NRSP-6 progress was sent to all regional association spring meetings, and essentially makes up the Impact Statement below.

Visitors: The genebank hosted the annual national meeting of NRSP-6 TAC in July 2011. We cooperated with Master Gardeners to teach third grade students of the local private and public schools about the diversity of potatoes and plant a potato garden they harvested in the fall. This taught students where their food comes from and about genetic diversity. Dr. M. Srivastav, Senior Scientist at the Indian Ag Research Institute in New Delhi, India toured the genebank, as did a delegation of nine potato specialists from Guizhou province, China (hosted by J. Palta, WI).

Bamberg continued as Editor in Chief for the American Journal of Potato Research, and Chair of the USDA/ARS Potato Crop Germplasm Committee.

IMPACT STATEMENT and Regional Meeting Agenda Brief

In 2011, we were particularly successful in the number and yield of seed increases, and orders for germplasm remained strong. We uploaded much evaluation data on tuber calcium and antioxidants to the public internet database.

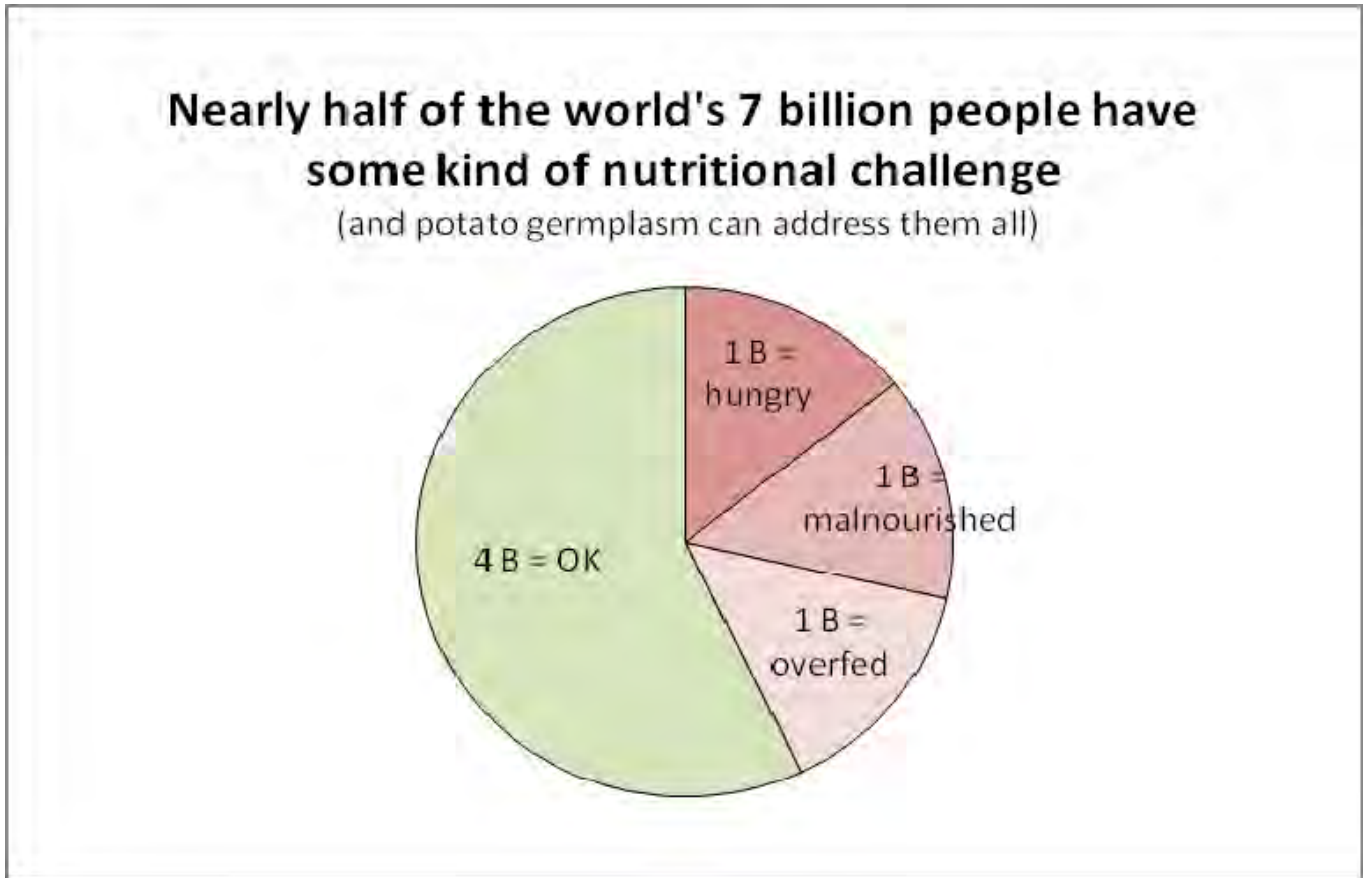
The payoff in funding the genebank is in discovering and deploying traits that are useful to the public and the industry. We added four new golden-fleshed potatoes to the collection, and selected several from within the genebank. Working with cooperators from WA and OR, these selections were shown to allow the production of chips and fries with the desired

yellow color, but much reduced levels of the toxin acrylamide. We added to the genebank the clone with phenomenal levels of total antioxidants—as high as leafy green vegetables—which we selected with help of cooperators in TX and WA. Our work with cooperators in Peru continued to make progress on identifying germplasm which responds to calcium applications with better yield, tuber quality, and frost resistance. Work continued on the project to do multiplex tuber testing of the species *microdontum* which has a remarkable array of useful traits, including anti-cancer components. This year we tested the 94 populations of that species for tuber greening, finding some with very strong resistance. S. Jansky tested powdered tuber samples of 400 cultivars and 30 wild species which we provided for analysis of starch types, pursuant to a potato with a lower glyceamic index. Continued work with a cooperator in IA resulted in identifying germplasm with more than 5-fold the natural appetite suppressing protein of standard cultivars—potentially a significant tool for addressing obesity. With an OR cooperator, we found levels of folate in exotic wild and cultivated species with over 5-fold that of standard cultivars, showing that potato could be bred to become a significant dietary source of this vitamin-- which impacts birth defects, cancer, heart disease, and mental health. We continued exploring for germplasm with higher potassium—a nutrient essential for preventing stroke and maintaining bone and muscle with age, but present at much below the optimal levels in the US diet.

We continued work on improving germplasm management. We again collected germplasm in-country, finding populations at sites never before reported or collected in AZ, NM and TX, and we have already identified two novel mutants in these materials. These and similar USA stocks were used as research models to find more efficient collecting methods. For example, we used AFLPs to identify certain sky-island mountain ranges in AZ with particular genetic diversity, and prioritized them for more intensive collecting. We tested winter tuberization trials in Davis and Parlier, CA.

We added about $25K in industry support for 2011. We already have a promise of $20K from two companies, and reasonable hope for significant additions to that from two more in 2012.

Of the **7** billion people on earth, one billion lack enough calories, one billion have enough calories, but are hurting for lack of essential nutrients, and another billion are overfed (The Economist, Feb18, 2012). NRSP6 collaborators are doing work that impacts each of these one-billion-man problems.



Stroke, cancer and obesity costs in the US are at least 100 times that of the total annual farmgate value of the potato crop, so we conclude that the prospect of making a significant impact through nutrition compares favorably with using germplasm to increase yield or reduce production costs. However, a more nutritious potato may also be the best help for producers, if a better potato would increase demand and our competitiveness with other food alternatives.

The genebank's role is two-fold—providing the germplasm and also providing the ideas and technology for how it can be best deployed.

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

We suffered a 15% reduction in ARS discretionary budget in FY11. In FY12 the outlook is for an *additional* 51% reduction, resulting in losing ½ of a position (del Rio) and very tight outlook for supplies spending. We do *not* want to respond to this situation by using our fixed cost resources less and getting less done. Instead we have made some staff adjustments to dedicate more work time to priority tasks. We are having more group meetings to better coordinate personnel efforts. We are making use of quite inexpensive summer student interns for routine plant care help, and the top students we have recruited also contribute to research work. Finally, their training is a genebank service contribution. Travel funds will be used only for events where we have particular duties or contributions, or when invited and paid by outside funds. Our planning has become more centered on getting the most, and the most

high impact results from doing the kind of work that we are already efficient at—that is, already have the equipment, facilities, and skills to do at relatively low cost (like making custom tuber samples and hybrids). We have also intensified multiplex tuber testing on the MMP (*microdontum*) project. We are planning, and will deploy a new initiative in summer 2012, dubbed "WOS" for With One Stone. This involves collecting a list of several technical questions (birds to kill) that can be overlaid on a single grow-out (with one stone). Thus, one might grow a set of populations for tubers to be used for a separate purpose, but, at the same time, assess effect of fertilizer application method, temperature regime, planting depth, etc., on tuberization. As already mentioned, particular emphasis on mining nutritional traits will continue. We continue to seek donations from private industry partners, as well as more traditional grants. At this writing, we have at least $23K committed from industry for 2012. We have an expectation of up to $15K from a Potato CGC evaluation grant. Beltsville has intention to support our germplasm collecting in 2012, and if that fails, the film company that has asked to accompany us has offered to help.

PUBLICATIONS

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Theses Reporting Research with NRSP-6 Stocks

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2012 NRSP-6 Germplasm Utilization Report from the North Central Region

Compiled and Submitted by
David S. Douches, NC representative

University of Wisconsin
Felix Navarro and Jiwan Palta

Our ongoing strategies include the use of lines derived from the crosses made with several wild species obtained from the NRSP-6 genebank including *S. andigena, S. brevidens, S. bulbocastanum, S. chacoense, S. curtilobum, S. demissum, S. gourlayi, S. leptophyes, S. phureja, S. raphanifolium, S. stenotomum, S. sucrense and S. tarijense*. The traits that this germplasm contribute to our breeding effort include fungal, bacterial, virus and nematode resistance as well as chipping and French fry quality. We have on hand over 250 lines derived from these species that are used in our program. For example the newly released (White Pearl) and advanced chipping breeding lines W2324-1, Nicolet (W2133-1), Tundra (W2310-3), W2717-5, W2978-3, and W5015-12 in our program were developed by using *S. tarijense* as the maternal grandparent providing chipping ability (*S. chacoense* also contributed on the paternal side of the pedigree). Our selections for late blight resistance include several wild or native species in their background such as *S. bulbocastanum, S. demissum, S. acaule, S. phureja, S. simplicifolium and S. stoloniferum*. We have a PVY selection project in collaboration with Amy Charkowski and Shelly Jansky in which we are screening resistance from existing varieties and germplasm from sources such as *S. andigena, S. stoloniferum, S. demissum, S. chacoense, S. jamessi* and *S. pinnatisectum*. Other breeding clones obtained from the the NRSP-6 genebank are actively used to generate specialty potato varieties due to the richness of these accessions to provide novel color and shape and other valuable attributes for this segment of the market. We have developed breeding lines that are in early and late stage of selections. One of these lines is a purple fingerling (W10251P/PW fing) that has been identified to be released as a potential specialty potato variety in the near future.

In addition we are conducting following projects in co-operation with NRSP-6:

The frost resistant breeding clones have been developed in cooperation with NRSP6 staff using S. *tuberosum*, S. *andigena*, S *commersonii*, and S. *acaule.* Elite clonal selections from this population have been evaluated at Hancock, Wisconsin and had good tuber type and cold hardiness to –5^{o}C. New lines are being developed using these good tuber type and *S. andigena* to select for better performance under Peruvian Highlands.

In 2012 we will continue to study polymorphism for a candidate genes associated to frost tolerance such as the steroyl-acyl carrier protein (ACP) desaturase (SAD) desaturase gene which catalyzes the desaturation of steroyl-ACP and provides changes in membrane lipid composition associated with variability for cold tolerance. For this pupose we are using several wild species including *S. sanctate-rosae, S. commersonii, S. demissum, S. megistracrobolum, S. cardiophyllum, S. polyadenium, S. bukasovii, S. acaule, S. chacoense and S. piurae*. In addition, F2 and BC_1 populations,generated from a cross made between the frost tolerant *S. commersomii* x *S. cardiophylum* (frost sensitive) accessions obtained from the NRSP-6, is being used to identify and validate molecular markers associated with frost tolerance using the SAD gene.

We hace developed progenies segregating for tuber calcium and soft rot resistance, using *S. microdontum* and *S. kurtzianum* species as parents. In cooperation with NRSP-6, we are evaluating these progenies to understand the genetics of tuber calcium uptake. In addition the entire collection of *S. microdontum* is being evaluated for tuber calcium and soft rot resistance.

We are continuing the cooperation with CIP to conduct calcium application trials in the highlands. We are getting impressive yield improvement with in-seasons calcium applications. These studies suggest our parallel ongoing program with NRSP-6 staff to enhance calcium uptake efficiency from *S. microdontum* introgression might also have application in some locations in the Andes. Species used = *microdontum, kurtzianum, tuberosum*.

We are also continuing our collaborative research on potato tuber as a source of potassium. Potato potassium is in a unique position to mitigate hypertension, which has huge health and economic impact. Potassium levels in the tubers are also correlated to the incidence of black spot bruise. We screened the 25 species of the mini-core collection and found significant species differences in K uptake potential. We are now testing 200 cultivars and breeding stocks for K.

Tuber acidity is being characterized in 25 species that form the mini-core collection at NRSP-6. This parameter is being evaluated in relationship to skin color and calcium uptake efficiency.

Christian Thill
University of Minnesota

Promising lines include MN02419Rus, MN18747, and MN02467Rus/Y for fry processing; MN03178-2Rus and MN02467Rus/Y for fresh russet; MN96072-4R/W, MN99460-14R/W, MN03505-3R/W, MN03021-1R/W, MN03027-1R/W, MN06030-1R/W, MN02616R/Y, and MN96013-1 for fresh red; MN02696, MN00467-4, MN02574, MN03339-4, MN02588, and MN99380-1Y for chips; MN02586Y, and MN04844-07Y for fresh yellow markets. MN02588 was identifies as having high resistance to Verticillium wilt.

We released MN15620 (MonDak Gold) to growers in 2011. Commercial testing continues exploiting its long-storage fry potential and as a roasted restaurant product. MN18747, MN02419Rus, MN02467Rus/Y, and MonDak Gold are fry lines with low acrylamide (less than 200ppb). Cultivar Russet Burbank had greater than 1000ppb acrylamide. Acrylamide is a known carcinogen found in processed food products, and is a major concern to the industry.

Chip potato line MN99380-1Y was selected for national US Potato Board testing due to its high yield and superior quality, and will be grown at 11 US locations in 2012. The red skin yellow flesh line MN02616R/Y is being expanded for commercialization and varietal release in 2012. These clones are maintained in tissue culture as virus free; seed was produced for stakeholder testing. Cold chipping (CC) was evaluated on populations developed from 2x-2x, 2x-4x, 4x-2x, and 4x-4x matings. Positive genetic gains resulted from early generation selection (EGS) for CC but were reduced by genotype by environment interactions. Greater genetic gains resulted by using 2x germplasm. Excellent CC performance resulted from 2x-2x matings.

VARIETAL RELEASES

MonDak Gold (MN15620) in 2011. Storage Processing and roasted restaurant product

MN18747 was approved for release by MAES February 2012. Early Processing and fresh

MN99380-1Y was approved for release by MAES February 2012. Storage chipper and fresh

MN02616R/Y was approved for release by MAES February 2012. Fresh red yellow flesh

DISEASE RESISTANCE

Late blight we evaluated 590 lines for resistance. Lines B0718-3, AWN86514-2, B0718-3, AWN86514-2, and AF4191-2 continue to show LB resistance. Another 42 MN lines have equivalent resistance. A second MN breeding population developed by crossing LB resistant lines Tollocan, Zarevo, and Atzimba, and from crossing Solanum species *S. bulbocastanum, S. cardiophyllum,* and *S. pinnatisectum* with tetraploid breeding lines has facilitated the development of 50 germplasm lines with significant LB resistance. 2012 NCR variety trial reports performance of lines submitted.

Common scab we evaluated 575 lines for resistance. Lines MSQ279-1, MSR169-8Y, Superior, B1992-106, A01010-1, A00286-3Y, AF2850-9, and MN18747 show resistance to CS. Among MN germplasm, 21 lines had no CS and another 35 lines had limited surface lesions. 2012 NCR variety trial reports performance of lines submitted.

North Dakota State University
Susie Thompson

Our program did not access any germplasm from NRSP6 this past year. We do not have any of the *S. opalescense* lines left from the screening Fernanda used in her MS project on silver scurf resistance. We have one of the *S. tuberosum* gp. *andigena* genotypes left (we call 52-6) from when I attempted to identify some genotypes that might have water/heat tolerance for use in developing sugar end resistant clones. We are using it as a parent this year in our crossing. We continue to use the lines in our program with *S. phureja* and *S. chacoense* backgrounds extensively, and in the past 2 years Shelley Jansky has shared some of her hybrids with *S. infundibulaforme* and others with me (B18, M1 to M5 and M7 for example).

I want to work more with screening germplasm and incorporating attributes into improved genotypes.

Michigan State University
David Douches

Germplasm Enhancement

To supplement the genetic base of the varietal breeding program, we have a "diploid" (2x = 24 chromosomes) breeding program in an effort to simplify the genetic system in potato (which normally has 48 chromosomes) and exploit more efficient selection of desirable traits. This added approach to breeding represents a large source of valuable germplasm, which can broaden the genetic base of the cultivated potato. The diploid breeding program germplasm base at MSU is a synthesis of seven species: *S. tuberosum* (adaptation, tuber appearance), *S. raphanifolium* (cold chipping), *S. phureja* (cold-chipping, specific gravity, PVY resistance, self-compatability), *S.*

tarijense and *S. berthaultii* (tuber appearance, insect resistance, late blight resistance, verticillium wilt resistance), *S. microdontum* (late blight resistance) and *S. chacoense* (specific gravity, low sugars, dormancy and leptine-based insect resistance). Even though these potatoes have only half the chromosomes of the varieties in the U.S., we can cross these potatoes to transfer the desirable genes by conventional crossing methods via 2n pollen.

Integration of Genetic Engineering with Potato Breeding

Through transgenic approaches we have the opportunity to introduce new genes into our cultivated germplasm that otherwise would not be exploited. It has been used in potato as a tool to improve commercially acceptable cultivars for specific traits. Our laboratory has now 16 years of experience in *Agrobacterium*-mediated transformation to introduce genes into important potato cultivars and advanced breeding lines. We are presently using genes in vector constructs that confer resistance to Colorado potato beetle and potato tuber moth (*Bt-cry3A* and *Bt-cry1Ia1*), late blight resistance via the *RB* gene (from the wild potato species *S. bulbocastanum*) and also a late blight resistance gene we cloned from *S. microdontum*, drought resistance (*CBF1*), PVY, and lower reducing sugars with acid invertase gene silencing, and lastly nitrogen use efficiency from a barley alanine aminotransferase gene.

Late Blight: Our specific objective was to breed improved cultivars for the industry that have foliar and tuber resistance to late blight using a combination of conventional breeding, marker-assisted strategies and transgenic approaches. Through conventional breeding approaches, the MSU potato breeding and genetics program has developed a series of late blight resistant advanced breeding lines and cultivars that have diverse sources of resistance to late blight. This is a GREEEN-funded project. In 2011 we conducted late blight trials at the Clarksville Research Center. We inoculated with the US22 genotype, but the foliar reaction to the *Phytophthora infestans* was different from all previous years using US8. In some cases lines that were classified as resistant were susceptible. On the other hand, some of the lines with moderate resistance in previous years were highly resistant in 2011. In the 2011 trials, over 50% of the 182 early generation lines were resistant to late blight comprised of 12 sources of late blight resistance. Of the 146 advanced breeding lines and varieties tested, over 40% were classified as resistant. Fourteen sources of resistance can be traced in the pedigrees of these resistant lines. This data infers that we have a broad genetic base to combine resistance genes and also should be able to respond to changes in the pathogen. This observation has been supported by R-gene marker analysis in collaboration with Wageningen University. We used marker-assisted selection strategies to combine a resistance QTL through conventional breeding. One approach to breeding for foliar resistance to late blight is to use interploidy (4x-2x) crosses to introgress the late blight resistance from *Solanum microdontum*. Based on 2010 and 2011 data, eight of 10 4x-2x selections were resistant combining resistance from *S. microdontum* and varieties Stirling and Jacqueline Lee. At the diploid level 18 of 30 2x selections were resistant that combine resistance genes from *S. berthaultii* and *S. microdontum*. With these strategies, we are pyramiding common and unique R-genes for late blight resistance.

A candidate R-gene for late blight resistance was cloned from *S. microdontum*. The sequence of the gene was similar to blb3. The R-gene was cloned into a pBI121-derived vector driven by a constitutive promoter and we have conducted *Agrobacterium*-based transformations. These transformation experiments resulted in over 40 lines that are PCR positive for the candidate R-gene. These lines were propagated and field bioassays were conducted in 2011 for 10 of these lines. A range of resistance was observed. Four lines were classified as resistant with one line

having resistance similar to the parent line of the gene. These lines will be further characterized with additional isolates in 2012 and a field trial will be repeated.

Colorado potato beetle: With support from project GREEEN we conducted detached leaf bioassays on 42 lines with potential Colorado potato beetle resistance and two susceptible check lines. Each line was replicated three times and 10 neonate larvae were placed on the leaves in Petri dishes and evaluated at 4 and 7 days for defoliation and mortality. As expected, the lines that expressed the *cry3A* gene had the least feeding and almost complete mortality. One of our advanced breeding lines that has introgressed leptine-based resistance from *S. chacoense* along with a selection from USDA (ARS10301-1) had the best ranking for defoliation and mortality excluding the *cry3A* lines. We identified these lines and 10 others that will be used in crossing with our advanced germplasm. Some of these lines may also be targeted for volatile characterization. It should also be noted that three lines that expressed the *cry1Ia1* gene also had high larval mortality in the detached leaf bioassays. We can conclude that we have at least three resistance sources to consider in developing resistance varieties if GM potatoes would be accepted in the industry. We also evaluated advanced breeding lines from the breeding program for field defoliation by the Colorado potato beetle. Using the Montcalm Research Center beetle nursery, 40 lines with pedigrees of insect resistance germplasm were evaluated in replicated trials. Five lines showed significant reduction to defoliation. These lines are being used to make further crosses to advance this beetle resistance trait. We feel after 3 rounds of crossing this tetraploid germplasm we are starting to see some advancement in resistance introgressed from the wild species. However, much value would be gained if we could combine resistance mechanisms. For that reason, we need to identify additional sources of beetle resistance. Combining host plant resistance to insects in a commercially acceptable line is a great challenge.

We initiated our Colorado potato beetle resistance screening in 2010 and focused on screening our selections with detached leaf bioassays (no-choice) and screening new genetic material from NRSP-6 for resistance. The new accessions were screened through detached leaf bioassays and screened field cages. Plant resistance can fall into three categories: tolerance, antibiosis, and antixenosis. With a no-choice evaluation we were able to emulate commercial grower conditions and screen directly for antibiosis. Seedlings of plant introductions from *S. berthaultii* (PI 473331), *S. chacoense* (PI 320123), *S. pinnatisectum* (PI 186553) and *S. oplocense* (PI 473368) and potato lines with high and low *Bt-cry3a* expression, *Bt-cry1Ia1* and glycoalkaloid-based resistance were evaluated. In addition, a $2m^3$ cage was constructed over 10 potato plants and 50-80 newly emerged adult beetles were collected at the MRC and placed into each of the cages on MSU campus. These species were compared to the susceptible variety Snowden. The plants were checked weekly for the numbers and life stages of Colorado potato beetles along with beetle behavior (i.e. feeding, walking, resting, mating, position on plant) until adult emergence. Defoliation was recorded weekly from emergence of over-wintered adult beetles through emergence of the second-generation adults. In some cases the beetles clipped the leaves from the plants by chewing the petiole rather than feeding on leaves. We saw this behavior in previous studies when adult beetles were placed in no-choice cages of *cry3A* potato lines. Clearly some accessions are more resistant than other accessions and all are more resistant than Snowden. The 15 best selections were identified and were re-evaluated in 2011. The summary of the 2011detached leaf bioassays are in the table below. Only two lines did not show the resistance phenotype in 2011. The cage study in 2011 gave similar results to 2010. Based upon defoliation and mortality, four of the six accessions had individual lines that may have high levels of resistance to the beetle. We are now attempting to cross these lines to develop mapping and breeding populations.

2011 Wild species CPB- Detached-leaf Bioassay			
Five neonate CPB per DLB; 3 reps per line			
	7 /10 days		
	Mortality	mm2	
Line	%	Defolioated	
S. opl 1973368-3	93	3	
S. pnt 186553-8	73	5	
S. chc 458310-17	87	7	
S. chc 320287-21	100	12	
S. chc 123123-21	70	18	
S. chc 458310-5	33	37	
S. chc 320287-10	80	42	
S. opl 1973368-1	67	50	
S. chc 458310-2	47	67	
S. chc 123123-15	27	383	
S. chc 123123-3	13	433	

We have initiated a drought tolerance greenhouse study of the NRSP-6 core collection. We will report on this study in 2013. We will also conduct SNP genotyping of this core collection to compare the SNP diversity between this germplasm and the cultivated breeding pool of North America.

LNAME	FNAME	ORG	CITY	STA	CMT	USE
Amy	Francine	St. Patrick Parish	Kinsman	Ohio	Teach students about farming.	HOME
Bauter	Robert S.	Suburbhomestead's Blog	Mosinee	Wisconsin	Organic trial of Butte.	HOME
Bradeen	Dr. James	University of Minnesota	St. Paul	Minnesota	R-gene mining effort in Solanum.	PATHO
Caravati	Curzio	Kenosha Potato Project	Kenosha	Wisconsin	For tuber increase for seed savers.	HOME
Carrington	Lisa		Oxford	Kansas	Testing varieties in Kansas environment.	HOME
Castillo	Dr. Jose A.	The University of Chicago	Chicago	Illinois	Testing resistance to bacterial Wilt.	GENET
Charkowski	Dr. Amy	University of Wisconsin	Madison	Wisconsin	Clonal material from agroponics.	PATHO
Coombs	Joseph	Michigan State University	East Lancing	Michigan	Clonal accessions for breeding work.	BREED
Coombs	Joseph	Michigan State University	East Lancing	Michigan	Clonal accessions for breeding work.	BREED
Davis	Kevin & Florence		Columbus	Ohio	Clonal tubers for home use.	HOME
Del Rio	Dr. Alfonso	University of Wisconsin	Madison	Wisconsin	Cultivars from Peru for Ca experiments.	GENET
Dillmon	Kaitlin		Oxford	Kansas	Testing varietal growth in Kansas	HOME
Genger	Ruth	University of Wisconsin	Madison	Wisconsin	Optimize hydroponic system for seed potato production.	PHYSI
Genger	Ruth	University of Wisconsin	Madison	Wisconsin	Optimize hydroponic system for seed potato production.	PHYSI
Greaves	Dr. John A.	Kemin Industries, INC	Des Moines	Iowa	Screening tuber peptide - proteinase inhibitor 2.	BREED
Greaves	Dr. John A.	Kemin Industries, INC	Des Moines	Iowa	Screening tuber peptide - proteinase inhibitor 2.	BREED
Greaves	Dr. John A.	Kemin Industries, INC	Des Moines	Iowa	To breed insect resistance into Kemin stocks.	BREED
Greaves	Dr. John A.	Kemin Industries, INC	Des Moines	Iowa	Screening tuber peptide - proteinase inhibitor 2.	BREED
Greaves	Dr. John A.	Kemin Industries, INC	Des Moines	Iowa	Screening tuber peptide - proteinase inhibitor 2.	BREED
Greaves	Dr. John A.	Kemin Industries, INC	Des Moines	Iowa	Screening tuber peptide - proteinase inhibitor 2.	BREED
Greaves	Dr. John A.	Kemin Industries, INC	Des Moines	Iowa	Screening tuber peptide - proteinase inhibitor 2.	BREED
Greaves	Dr. John A.	Kemin Industries, INC	Des Moines	Iowa	Screening tuber peptide - proteinase inhibitor 2.	BREED
Greaves	Dr. John A.	Kemin Industries, INC	Des Moines	Iowa	Screening tuber peptide - proteinase inhibitor 2.	BREED
Greaves	Dr. John A.	Kemin Industries, INC	Des Moines	Iowa	Screening tuber peptide - proteinase inhibitor 2.	BREED
Greaves	Dr. John A.	Kemin Industries, INC	Des Moines	Iowa	Screening tuber peptide - proteinase inhibitor 2.	BREED
Greaves	Dr. John A.	Kemin Industries, INC	Des Moines	Iowa	Screening tuber peptide - proteinase inhibitor 2.	BREED
Hogan	Cliff	University of Wisconsin	Madison	Wisconsin	Screening for resistance to Pectobacterium carotovorum.	PATHO
Hoopes	Dr. Robert W.	Frito-Lay, Inc	Rhinelander	Wisconsin	Breeding work.	BREED
Jiang	Dr. Jiming	University of Wisconsin	Madison	Wisconsin	Genome work.	GENET
Jiang	Dr. Jiming	University of Wisconsin	Madison	Wisconsin	Genome work.	GENET
Kirk	Craig	Ohio Valley Law School	Warsaw	Ohio	Comparing greenhouse and hydroponic units growth.	STA
Larson-	Greta		Humbird	Wisconsin	Breeding locally adapted food crop varieties suitable for organic	HOME

Jensen					systems.	
Leue	Ellen	PanAmerican Plant Research	Elburn	Illinois	Breeding diploid edible ornamental.	BREED
Leue	Ellen	PanAmerican Plant Research	Elburn	Illinois	Breeding diploid edible ornamental.	BREED
Malinski	Luke	University of Columbia	Columbia	Missouri	Study pistil side S-RNase self incompatibility.	GENET
Maronek	Carole		Ellison Bay	Wisconsin	Tasting tubers.	HOME
Marr	Deborah	Community Garden	Dayton	Ohio	Growing vegetables in a community garden.	HOME
McColly	Fred	Indiana University Northwest	Lake Station	Illinois	Perennial Garden Project.	ANTHO
Meece	Sam		Cincinnati	Ohio	Home gardening	HOME
Meyer	Matt		Sturgeon Bay	Wisconsin	Ornamental garden planting.	HOME
Palta	Dr. Jiwan	University of Wisconsin	Madison	Wisconsin	Looking at cultivar seeds.	PHYSIO
Palta	Dr. Jiwan	University of Wisconsin	Madison	Wisconsin	Cold hardiness research.	PHYSI
Palta	Dr. Jiwan	University of Wisconsin	Madison	Wisconsin	Cold hardiness research.	PHYSI
Petrick	Janina	CETS Technology	Sussex	Wisconsin	Testing variety for vodka production.	PHYSI
Ronis	Daniel H.	Frito-Lay	Rhinelander	Wisconsin	flesh color selections for asparagine screening.	PHYSI
Ryan-Mahmutagic	Molly	Pioneer Hi-Bred	Waukee	Iowa	Stink bug screening.	ENTOM
Schadeck	Fredrick		Springfield	Missouri	Varieties to breed open pollinated true potato seed.	BREED
Simrell	Merle	De Somerville Farm	Walker	Missouri	Varietal stock for regional production evaluation.	STOCK
Simrell	Merle	De Somerville Farm	Walker	Missouri	Varietal stock for regional production evaluation.	STOCK
Stacey	Kavion	Theodore Roosevelt Public School	Cincinnati	Ohio	Teach children about ancestral ways of farming.	HOME
Sturner	Tom	Lapeer Produce Unlimited	Lapeer	Michigan	Small garden plot.	HOME
Thill	Dr. Christian	University of Minnesota	St. Paul	Minnesota	Late blight field evaluations.	PATHO
Utter	Crystal	FGNA June Grove Garden	Bloomington	Illinois	Organic potato plot trial.	HOME
Villegas	Andrew		Bedford Heights	Ohio	Looking at pest and temp resistance.	HOME
Wang	Yi	University of Wisconsin	Madison	Wisconsin	Testing differences in amounts of telomeres in potato A, B, E, P genomes.	GENET
Zlesak	David	University of Wisconsin - River Falls	River Falls	Wisconsin	Classroom excerise with plant tissue culture.	EDU

Report to NRSP-6 Technical Committee, April 2012

Northeast Region Representative: Walter De Jong

The Northeast region received 183 units of germplasm, spread across 18 requests, in 2011.

Comments received from recipients follow:

Stuart Campbell (grad student / postdoc at Cornell University, Andre Kessler lab)

Requested ten units – looking at insect defense traits in self-compatible solanacaeae..

The genebank was invaluable to me last year - half of my dissertation (and now postdoc) is examining the coevolution of mating systems and defences in wild Solanaceae, including numerous wild potatoes. Without the genebank, my study wouldn't have nearly the taxon sampling and impact it now has. Last year, we used the seed material to conduct experiments on the diversity and quantity of herbivore-induced secondary metabolites (phenolics, alkaloids), and on the evolution of resistance to herbivores. We are now continuing this work to examine interactions between pollinators and herbivores.

I actually just requested additional germplasm to continue these studies - again, this would not be possible without the genebank.

Greg Porter, University of Maine

Requested 11 units – for use in the U Maine potato breeding program

The genebank provided excellent service. In the last two years I have primarily requested material to use as parents to introduce new disease resistance, quality, and genetic backgrounds into our materials. You know the drill, and how many years it takes to deliver a new variety from this, ... but it is needed. We use some of these materials as parents each year and materials from the crosses are moving through the selection program. Virus and late blight resistance are the major disease resistance traits, but cyst nematode resistance and other traits are also being sought. Along that line, we got TPS of some of the Cornell material that Bob Plaisted developed with both virus and cyst nematode resistance. Seedling tubers were grown in 2011 and will go to the field for selection in 2012. I hope to get some adapted clones that can be used as parents to introduce better resistance into our materials.

Tom Griffin, New York City

Requested 1 unit – for testing growth in pots on balcony.

I was very grateful to receive the 3 sprouts. Although I planted them, all 3 first grew and then withered and died without ever having gotten to the stage of delivering potatoes.

I attach a photo of one of them. It's the plant on the far left.

My interest was to see if a potato plant could be grown on a small balcony in the NYC metropolitan area.

Steve Turaj, University of New Hampshire

Requested thirteen accessions.

Am trying varieties with Late Blight resistance, also early maturing ones that may be adopted by small farm operations in Coos County NH. These would be for Farmers Mkt or Farm stand sales. Hoping, if can find a few they like, they may be saved by them and used as a back-up variety in case we have a severe Late Blight outbreak, like we had a few years ago. I will be dropping off some of these, that I have been chitting, at a farm next week.

Have been happy with my interactions with the genebank, great to have a source of plant material that would be otherwise unavailable to these farmers

Southern Region Report to NRSP-6 Technical Committee

J. Creighton Miller, Jr.

April 17-18, 2012

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

There are three states 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 states periodically conduct potato research utilizing NRSP-6 stock.

Twenty four orders from 23 entities/individuals in the Southern Region ordered accessions.

2011 SOUTHERN REGION ORDERS

Blane Bourgeois iconoclast_psychoacoustics@yahoo.com PHONE: (870) 895-3174 biodiversity. (49-TU), STOCK	The Rare Vegetable Seed Consortium Salem, Arkansas Research of landraces and preservation of
Jennifer Chenoweth jenniferchenoweth@gmail.com PHONE: (478) 319-4061 (1-S), HOME	Bonaire, Georgia Researching growth and development of plants.
Mark E. Clough mark_clough@ncsu.edu PHONE: (252) 793-4428 program. (63-IV), PHYSI	NCSU/VGJREC Plymouth, North Carolina Incorporating PVY resistance into breeding
Jesse Cox texasboy36@comcast.net PHONE: (404) 862-3750 (2-TU), HOME	Marietta, Georgia Student growout.
Daniel Douglass iddoug2000@yahoo.com PHONE: (305) 253-5931 qualities. (9-S), HOME	Miami, Florida Looking at golden tubers with good cooking

Daniel Douglass iddoug2000@yahoo.com PHONE: (305) 253-5931 qualities. (11-TU), HOME	Miami, Florida Looking at golden tubers with good cooking
Julie Fulks juliefulks@comcast.net PHONE: (352) 636-3173 (1-S), HOME	Fulks Bros. Groveland, Florida Cultivate an heirloom seed inventory.
Charles Fuller charles-fuller@att.net PHONE: (601) 383-0896 (2-TU), HOME	Back Forty Research Newton, Mississippi Adaptation to soil and climate.
Charles Fuller charles-fuller@att.net PHONE: (601) 383-0896 (9-TU), HOME	Back Forty Research Newton, Mississippi Adaptation to soil and climate.
John Hawkins johnhawk66@yahoo.com PHONE: (407) 884-5181 (1-TU), HOME	Garden Science Apopka,Florida Home garden.
Jeff Holubovsky jsholubovsky@gmail.com PHONE: (731) 693-3476 (2-TU), HOME	Holubovsky Farms Oakfield, Tennessee Testing growth in Tennessee.
Jie Huang jh259@duke.edu PHONE: (919) 886-2857 duplication in (11-S), GENET	Duke University Durham, North Carolina Study the evolutionary process of a gene Solanaceae.
Jie Huang jh259@duke.edu PHONE: (919) 886-2857 duplication in (1-S), GENET	Duke University Durham, North Carolina Study the evolutionary process of a gene Solanaceae.

Brady Leighton bllotane@uga.edu PHONE: (706) 296-8217 environment. (1-TU), HOME	Lotane Athens Locally Grown Watkinsville, Georgia High calorie veggie growth in Georgia
Will Mancuso barnibus27@gmail.com PHONE: (850) 774-7663 (1-S), HOME	Osucnam Youngstown, Florida Comparing lighting and soil conditions.
Terry Martin t_cmartin@hotmail.com PHONE: (706) 517-1717 (4-S), HOME	Shorter University Crandall, Georgia Testing growth in his environment.
Andrea Moodhart anmood2@email.uky.edu PHONE: (859) 323-5041 (4-TU), HOME	University of Kentucky Lexington, Kentucky Home Gardening.
Corinna Potter corinna.potter@gmail.com PHONE: (870) 538-5054 (12-S), HOME	Grow Knowledge Challenge Dermott, Arkansas Environment comparison class project.
Joseph Puentes makas@nc.rr.com (4-TU), BREED	 Rougemont, North Carolina Tubers for garden plot evaluation.
Zhou Quiliana photographysimona@yahoo.com PHONE: (334) 220-8274 (6-TU), HOME	Organic Gardening Montgomery, Alabama Home gardening.
Randi Roark rrmttreasures@live.com PHONE: (606) 349-6695 (1-TU), HOME	Festive Creations Salyersville, Kentucky Home gardening.
Carrie Ann Sawyer c.sawyer479@hotmail.com PHONE: (479) 246-0308 (2-TU), HOME	Urban Farmers United Rogers Arkansas Looking at growth in Arkansas environment.

Tyler Shaw spurs_tyler20@yahoo.com PHONE: (210) 675-3066 (1-S, 1-TU), HOME	Group Gardening San Antonio, Texas Home garden.
Dorine Spratling dorine1943@msn.com PHONE: (337) 599-2306 (5-S), HOME	Ville Platte, Louisiana Testing growth in Louisiana.
Beverly Thomas bdstick31@yahoo.com PHONE: (817) 458-8038 (9-S), HOME	Cold Springs Farm Weatherford, Texas Research, seed saving, education
Dr. Richard Veilleux potato@vt.edu PHONE: (540) 231-5584 (3-IV), BREED	Virginia Polytechnic Institute Blacksburg, Virginia Haploid extraction from cultivars.
Dr. Richard Veilleux potato@vt.edu PHONE: (540) 231-5584 (1-S, 3-IV), BREED	Virginia Polytechnic Institute Blacksburg, Virginia Phytonutrient studies.

Texas – J. Creighton Miller, Jr.

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 2011, 99,328 first-year seedlings representing 661 families were grown, and 490 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). The advanced selection ATTX 961014-1R/Y was released in 2012. A major effort continued in 2011 involving research on the Zebra Chip Complex with emphasis on screening for host plant tolerance/resistance. Additional information about the Texas breeding program can be found at: http://potato.tamu.edu

Current studies are investigating the antiproliferative properties of selected potato accessions on prostate cancer. The antiproliferative activity of phenolic extracts from *Solanum kurtzianum* was studied in an *in vivo* mouse model, in which PC-3 prostate cancer cells were injected into the dorsal flanks of mice to induce tumor development. Following the development of palpable tumors, mice were treated with 0.75 mg chlorogenic acid equivalents of potato extract every other day. However, the glycoalkaloids in the extract from *S. kurtzianum* material had a toxic effect on the mice when injected and the impact on tumor development was not determined. *S. bulbocastanum* was used as a substitute for *S. kurtzianum* as it has a lower amount of total glycoalkaloids (TGA), but comparable levels of total phenolics (TP) and antioxidant activity (AOA). There was no significant impact of bioactives from *S. bulbocastanum* on prostate cancer development. Future *in vivo* work will re-evaluate the anticancer activity of *S. kurtzianum* extracts using oral gavage, which has been demonstrated as a safe delivery method for glycoalkaloids. This project continues in cooperation with Dr. Roy Navarre (USDA/ARS Prosser, WA) and Dr. Lavanya Reddivari (Colorado State University) as part of a project entitled "Maximizing the Nutritional Value/Health Benefits of Potato by Metabolic Profiling and Identification of Compounds with Anticancer Properties in Wild Potato Species".

Reports Produced in 2011

Miller, C., D. Scheuring, and J. Koym. 2011. Texas Potato Breeding Report, 2010. Texas AgriLife Research, College Station and Lubbock. 394p.

Miller, J.C., Jr., J.W. Koym, D.C. Scheuring, and J.P. Miller. 2011. Southwest Regional Potato Variety Trial Report 2010. Texas AgriLife Research, College Station and Lubbock. 22p.

Miller, C., J. Koym, and D. Scheuring. 2011. 2011 Field Day Handbook. July 20, 2011. Texas Potato Variety Development Program. Texas AgriLife Research, College Station and Lubbock. 29p.

Turner, S.D., J.C. Miller, Jr., and R.D. Lineberger. 2011-. Texas A&M University Potato Breeding and Variety Development Program. http://potato.tamu.edu

Peer-reviewed manuscripts.

Butler, C.D., B. Gonzalez, M.L. Keremane, R.F. Lee, R.G. Novy, J.C. Miller, and J.T. Trumble. 2011. Behavioral responses of adult potato psyllid, Bactericera cockerelli (Hemiptera: Triozidae), to potato germplasm and transmission of Candidatus Liberibacter psyllaurous. Crop Prot. 30:1233-1238.

Bamberg, J.and J.C. Miller, Jr. 2012. Comparisons of *ga1* with other reputed gibberellin mutants in potato. Amer. J. Potato Res. 89:142-149.

Virginia – Richard Veilleux

The Potato Genome Sequencing Consortium completed sequencing, annotating and publishing the genome of a doubled monoploid clone (DM 1-3 516 R44) developed at Virginia Tech. The DM now serves as the draft potato genome. Variety trials were conducted by Josh Freeman at the Eastern Shore Agricultural Research and Extension Center in Painter, Virginia. Hybrids between potato cultivars and diploid derivatives of the DM that have 2n pollen were made for eventual field testing. We have employed the Illumina SNP chip designed for potato to develop a genetic map for a hybrid population developed by crossing the sequenced DM clone with RH, the heterozygous diploid that had been partially sequenced. The hybrids have been characterized for various morphological traits. Allelic diversity of four genes controlling potato glycoalkaloid production has been studied in a diploid population derived from a cross between *S. chacoense* and *S. phureja* as well as in some accessions of wild diploid potatoes that differ for steroidal glycoalkaloid (SGA) production. SNP polymorphism for these key genes in the pathway has been documented. In addition, expressing a *S. chacoense* allele of 3-hydroxy-3-methylglutaryl CoA reductase 2 (hmg2) gene in transgenic Desiree was found to significantly alter the SGA profiles.

Peer-reviewed manuscripts.

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Xu X, Pan SK, Cheng SF, Zhang B, Mu DS, Ni PX, Zhang GY, Yang S, Li RQ, Wang J, Orjeda G, Guzman F, Torres M, Lozano R, Ponce O, Martinez D, De la Cruz G, Chakrabarti SK, Patil VU, Skryabin KG, Kuznetsov BB, Ravin NV, Kolganova TV, Beletsky AV, Mardanov AV, Di Genova A, Bolser DM, Martin DMA, Li GC, Yang Y, Kuang HH, Hu Q, Xiong XY, Bishop GJ, Sagredo B, Mejia N, Zagorski W, Gromadka R, Gawor J, Szczesny P, Huang SW, Zhang ZH, Liang CB, He J, Li Y, He Y, Xu JF, Zhang YJ, Xie BY, Du YC, Qu DY, Bonierbale M, Ghislain M, Herrera MD, Giuliano G, Pietrella M, Perrotta G, Facella P, O'Brien K, Feingold SE, Barreiro LE, Massa GA, Diambra L, Whitty BR, Vaillancourt B, Lin HN, Massa A, Geoffroy M, Lundback S, DellaPenna D, Buell CR, Sharma SK, Marshall DF, Waugh R, Bryan GJ,

Destefanis M, Nagy I, Milbourne D, Thomson SJ, Fiers M, Jacobs JME, Nielsen KL, Sonderkaer M, Iovene M, Torres GA, Jiang JM, Veilleux RE, Bachem CWB, de Boer J, Borm T, Kloosterman B, van Eck H, Datema E, Hekkert BTL, Goverse A, van Ham R, Visser RGF, Potato Genome Sequencing C (2011) Genome sequence and analysis of the tuber crop potato. Nature 475: 189-U194

Aulakh SS, Veilleux RE, Flinn BS (2011) Characterization of activation tagged potato (*Solanum tuberosum* L.) mutants. In Vitro Cellular & Developmental Biology-Animal 47: S52-S52

North Carolina – Craig Yencho

No report received.

Western Region Report - NRSP-6 Technical Committee

David G. Holm

April 17, 2012

During 2011, NRSP-6 supplied stocks to the following Western states: Alaska, Arizona, California, Colorado, Idaho, Montana, Oregon, and Washington (Table 1). Western Region USDA/ARS requests are not included in this report.

Twenty-five entities via 40 requests ordered 849 units. Potato materials were requested by universities and research institues (University of Arizona, University of California, Colorado State University, University of Idaho, Montana State University, Oregon State University, and the Salk Institute), colleges (Foothill College and Cuyamca College), and many private companies and farms (Table 1).

Table 1. NRSP6 Distributions in the Western Region - 2011.

LNAME	FNAME	ORG	CITY	STA	CMT	ACCOUNT
Biehm	Kyle		Phoenix	Arizona	Research of climate growth of seeds.	(3-TU)
Carney	Kim	University of California	Davis	California	Producing transgenic plants.	(8-IV)
Fleischmann	Erick	Sapphire Tuber Research	Florence	Montana	Testing for drought tolerance.	(5-S)
Goldberg	Lindsay	Sweet Horizon Seed Exchange	Santa Cruz	California	Testing growth in coastal climate.	(1-S)
Goyer	Aymeric	Oregon State University	Hermiston	Oregon	Looking at vitamins in potatoes.	(44-TU)
Goyer	Aymeric	Oregon State University	Hermiston	Oregon	Field tubers for looking at vitamins in potatoes.	(14-TU)
Goyer	Aymeric	Oregon State University	Hermiston	Oregon	Field tubers for looking at vitamins in potatoes.	(1-TU)
Guo	Yongxia	Salk Institute	La Jolla	California	deep sequencing	(44-S)
Guo	Yongxia	Salk Institute	La Jolla	California	deep sequencing	(1-S)
Holm	Dr. David G.	Colorado State University	Center	Colorado	Multi-location Kamin project tubers.	(11-TU)
Holm	Dr. David G.	Colorado State University	Center	Colorado	For stocking certified tubers for future Vodka research.	(4-IV)
Holm	Dr. David G.	Colorado State University	Center	Colorado	For stocking certified tubers for future Vodka research.	(3-IV)
Huntington	Tim	Chehko Klah	Washougal	Washington	Small scale carbohydrate production.	(7-TU)
Jenkins	Dr. Philip	Herbarium ARIZ	Tucson	Arizona	Herbarium specimens of Arizona collections for the AR	(11-HE)
Krucker	Michele	J.R. Simplot Co.	Boise	Idaho	Accessions with good vine vigor.	(10-S)
Krucker	Michele	J.R. Simplot Co.	Boise	Idaho	Protein test stocks	(3-TU)
Landis	Joshua		Woody Creek	Colorado	Trial plots for vodka.	(3-PL)
Machado	Rick	Machado Farms	Manfree	California	Varietal development with heat and drought tollerant se	(5-TU)
Machado	Rick	Machado Farms	Manfree	California	Varietal development with heat and drought tollerant se	(1-S)
Machado	Rick	Machado Farms	Manfree	California	Varietal development with heat and drought tollerant se	(1-S)
Mannion	Ellen		Fairbanks	Alaska	Testing viability of varieties in Fairbanks, Alaska.	(3-TU)
Mulhair	Corey	Foothill College	Cupertino	California	testing exposure to pollutants fumes and pesticideferti	(5-TU, 8-IV)
Murray	Bill	North Clark County Food Research	La Center	Washington	Determin yield in soils with different clay mixes.	(3-TU)
Pearson	Gary	UC-Davis	Davis	California	Stocks for California field tuber increase.	(245-PL, 20-TU)
Radtke	James	Citrus US LLC	San Diego	California	Developing breeding populations.	(8-IV)
Sands	David	Montana State University	Bozeman	Montana	Evaluation of glycemic index in potato.	(18-IV)
Stewart	John	Gardens of Eden	Sweet Home	Oregon	Trialing for potential in the Pacific Northwest.	(3-S, 2-TU)
Stewart	John	Gardens of Eden	Sweet Home	Oregon	Trialing for potential in the Pacific Northwest.	(8-S)
van Hest	Peter	Bejo Seeds, Inc	Oceano	California	Varieties for tuber production.	(8-IV)
van Hest	Peter	Bejo Seeds, Inc	Oceano	California	Varieties for tuber production.	(6-TU)
van Hest	Peter	Bejo Seeds, Inc	Oceano	California	Varieties for tuber production.	(18-TU, 1-S)
Wagner	Thomas		Everett	Washington	Breeding work.	(8-S, 33-TU)
Wagner	Thomas		Everett	Washington	Breeding work.	(209-TU)
Wagner	Thomas		Everett	Washington	Breeding work.	(1-S)
Wagner	Thomas		Everett	Washington	Breeding work.	(3-IV)
Whiteside	Amy	Sunset Acres	Jefferson	Oregon	General trials and breeding.	(14-S, 10-TU)
Williams	Daniella	Engineering Student - Cuyamca College	San Diego	California	Identify diseases in common tubers.	(7-TU)
Williams	Rose		El Cajon	California	Taste and shelf life.	(1-S, 1-TU)
Wing	Dr. Michael R.		Kentfield	California	High school project looking at cold hardy potatoes.	(3-TU)
Yilma	Solomon	Oregon State University	Corvallis	Oregon	New clones for breeding in tri-state area.	(20-IV)

General Reports

Colorado State University - David Holm

We received materials from NRSP-6 for two different projects. We are working with Kemin Industries, Inc. and NRSP-6 to evaluate materials for a satiety product. The goal is to reduce extraction costs associated with the product by increasing the levels in potato tubers. Another aspect of the project is looking at GxE to determine suitable potato production areas for raw product.

The second project is working with a start-up vodka venture. They are interested in evaluating materials that are most suitable for their production process.

Montana State University - David Sands

We are using the potato germplasm sent to us last year in an effort to produce low glycemic potatoes for both the reatil market and for processing. The six lines that you sent us arrived in good condition and now are being analyzed for their amylose:amylopectin ratios. This is a good but not perfect indicator of glycemic index. They are being compared with several "low glycemic" lines. We have received two research grants to work with potatoes that may be a part of a healthy diet for everyone but especially for those with diabetes.

North Clark County Food Research - Bill Murray

The potato germplasms that I received were planted in different mixtures of clay type soil mixed with a 3 way type of soil consisting of sand, local dirt, and compost. I received very few of the germplasms and I only had 2 that actually sprouted out of the soil mixture, they died after roughly 2 weeks after sprouting. Would have been nice if there were some type of instructions on how to handle and plant these, as I may have had better success. We have only planted potatoes that were from sprouting potatoes in the past and not like what we were sent. Thank you for the opportunity to be a part of your program.

University of California, Davis, Plant Transformation Facility - Kim Carney

We requested germplasm for use at the Plant Transformation Facility, University of California, Davis. We are a service facility and have had requests to produce transgenic potato, but the germplasm we had on hand was not amenable to in vitro manipulation. We were quite pleased to be able to receive sterile cultures in excellent condition from NRSP6 of two potato lines that have allowed us to successfully produce transgenic potato and contribute to the research programs of several PI's on campus. Thank you again for providing the cultures.

J. R. Simplot Company - Michele Krucker

We have received the core potato collection as TPS as well as some microdontum and etuberosum as TPS. These were grown up and analyzed for overall plant growth (structure, leaf morphology, flower and fruit formation). We also received some late blight differential clones as tissue culture plantlets. We are analyzing these for resistance to various late blight strains. Everything arrived in very good condition and communication, as well as documentation by NRSP6 was excellent.

Unfortunately, we are in the middle of some experiments which haven't been published yet so I can't give you all the details. We recently started communicating with Dr. Bamberg and are very excited to collaborate with the NRSP6 team. We believe the Potato Genebank is an absolute necessity and it will play an integral role in the future of potato genetics.

Bejo Seed, Inc. - Peter van Hest

For over a DECADE Bejo Seeds, Inc. has requested and received potato varieties and families from the NRSP6, anywhere from 30 to 70 individuals annually.

The material is entered into an evaluation for system with the intent to use the received materials for breeding purposes to develop varieties competitive in the world's potato markets.

As such, the service NRSP6 provides it is invaluable to us. In today's world it is complicated and time consuming to move new genotypes across borders. To have access to varieties from around the world is a great advantage and allows us to increase the diversity of our working lines, while both national and international rules and regulations are adhered to.

It also provides a source for usual and unusual controls of all marketing type potatoes in our experimental plots, another value not much mentioned.

Oregon State University - Aymeric Goyer

Publications:

Goyer A, Sweek K (2011) Genetic diversity of thiamine and folate in primitive cultivated and wild potato (Solanum) species. Journal of Agricultural and Food Chemistry 59: 13072-13080. DOI: 10.1021/jf203736e

Goyer A, Haynes KG (2011) Vitamin B1 content in potato: effect of genotype, tuber enlargement, and storage, and estimation of stability and broad-sense heritability. American Journal of Potato Research 88: 374-385

The materials were of very good quality and were received in excellent conditions.

Machado Farms - Rich Machado

We received several cultivars in 2010, 2011, and 2012, including Gui Valley, Stick Valley, LT-2, Bora Valley, Ursa, and some TPS from primitive cultivars, and this year, some in-vitro seedlings.

Bora Valley continues to be the best heat and drought resistant variety we grow, although others may prove this year to measure up also. We felt so strongly about Bora Valley that we did a cross with an s.chacoense primitive variety and Bora Valley. The s.chaco was extremely drought tolerant and had a long dormancy, and seemed to germ without water in extreme summer heat.

The result was a tuber we are calling Blue Leslie, which so far combines strong germ, heat and drought resistance, low glycoalkaloids. The dormancy isn't quite what we like, but we are looking to improve that. This year we will increase our production to gain some TPS in bulk.

The other varieties performed well, and store well. LT-2 seems to have strong heat tolerance and good storage. This year we will push them in the heat and see what happens. The TPS has not been planted yet, but will be this year. The Stick Valley looks promising as it seems to be scab resistant, whereas Bora Valley is prone to this. All need to be tested further.

Sunset Acres - Amy Whitesides

I have not done much with the seedling potatoes, they are in pots and didn't have much of a crop just because I got them later in the year. I got about half a pound of each of the seedlings. Now the seeds on the other hand, have not been planted yet. I'm hope to have a better list for you next time I get this Email, so that way you will have more real data to pass along.

Everything that was sent came in good shape. The only concern was the dryness of the potato seedling's. It was not a big deal, the seedlings turned out fine.

Oregon Breeding & Variety Development - Solomon Yilma

Potato Virus Y (PVY) is one of major problems in potato production. We have integrated extreme resistance to PVY from two sources S. tuberosum andigena (Ryadg) and S. stoloniferum (Rysto). We have successfully implemented the molecular markers to track Ryadg and Rysto sources at early generation of our breeding program. Genes for extreme resistance to PVY (Ry genes) confer extremely high level of protection against
all strains of PVY. The resistant gene to PVY(Rysto) is associated with male sterility which affects intercrossing & genes pyramiding in potato breeding. A novel locus for extreme resistance to Potato virus Y (PVY), Ry-fsto, was identified on potato chromosome XII. The Ry-fsto gene is not associated with male sterility, therefore our breeding program has recently introduced several clones from NRSP6 (United States Potato Genebank). We are now making crosses to introduce the PVY Ry-fsto gene in our breeding program.

We have received the following clones in great conditions. The clones have several disease resistances & other important characteristics which will be integrated in to the Oregon breeding & variety development program.

NRSP6 (Unit	ACNO	VARIETY	ORGIN AND BRIEF DESCRIPTION
PI 661981	661981	ABUN	Donated by Ruiz de Galarreta, Centro de Investigacion y Mejora Agraria, Vitoria, Spain. Good flavor - PVY resistance. Tuber flesh yellow.
PI 661982	661982	BARBARA	Donated by Ruiz de Galarreta, Centro de Investigacion y Mejora Agraria, Vitoria, Spain. Origin from Germany - 1982. PVY (Ryfsto), PVX, PVA and PLRV resistance. Late blight resistance. Drought tolerance. Golden nematode resistance. Tuber flesh yellow.
PI 661983	661983	BZURA	Donated by Ruiz de Galarreta, Centro de Investigacion y Mejora Agraria, Vitoria, Spain. Origin from Poland - 1983. PVY (Ryfsto) and PVX resistance. Late blight resistance. High starch and dry matter content. Tuber flesh light yellow.
PI 661984	661984	FINA DE CARBALLO	Donated by Ruiz de Galarreta, Centro de Investigacion y Mejora Agraria, Vitoria, Spain. Good flavor. Tuber flesh yellow.
PI 661985	661985	GORBEA	Donated by Ruiz de Galarreta, Centro de Investigacion y Mejora Agraria, Vitoria, Spain. PVY and PLRV resistance. Late blight resistance.
PI 661986	661986	GOYA	Donated by Ruiz de Galarreta, Centro de Investigacion y Mejora Agraria, Vitoria, Spain. Origin from Spain - 1954. Late blight resistance. Frost hardness. Tuber flesh yellow.
PI 661987	661987	IHER	Donated by Ruiz de Galarreta, Centro de Investigacion y Mejora Agraria, Vitoria, Spain. PVY and PVX resistance. Resistance to black leg. Tuber flesh yellow.
PI 661988	661988	NAGORE	Donated by Ruiz de Galarreta, Centro de Investigacion y Mejora Agraria, Vitoria, Spain. Origin from Spain - 1990. PVY resistance. Very high dry matter content. Good processing traits. Tuber flesh yellow.
PI 661989	661989	RIOJA	Donated by Ruiz de Galarreta, Centro de Investigacion y Mejora Agraria, Vitoria, Spain. Origin from Germany - 1976. PVY (Ryfsto) and PVA resistance. Resistance to black leg. Golden nematode resistance.
PI 661990	661990	PASTUSA SUPREMA	Donated by Dr. Carlos Nunez, Universidad de Colombia-Bogota, Bogota, Colombia. Origin from Colombia - 2002. Highly resistant to late blight. High dry matter. PVY resistance. Good cooking traits.

Gardens of Eden - John Stewart

Results of 2011 primitive cultivar growout: 3 plants each of Guincho Negra & Huagalina in 30/70 sand/loam. Due to early frosts this year the last 2 months of growth were under plastic. Both gave good yields of small - medium tubers as well as TPS. All seedlings from TPS germplasm received last year are still being evaluted for desirable traits. All germplasm I have received from NRSP-6 has been of good quality & Jesse Schartner has been very helpful & courteous. Projects: Andean tuber polyculture using native intercropping methods for disease & pest control. Intercropping native potatoes (Solanum tuberosum ssp. andigenum), mashua (Tropaeolum tuberosum), oca (Oxalis tuberosa), & ulluco (Ullucus tuberosus). All of the native potatoes in the project are from NRSP-6.

Summary of the Clonal and True Potato Testing

at

The Plant Germplasm Quarantine Programs

NRSP-6 Technical Committee Meeting
College Station, TX / April 16-17, 2012

Jorge Abad, PhD
Senior Plant Pathologist-Project Leader
Potato and Sweet Potato Quarantine Programs
Registration, Identification, Permitting and Plant Safeguarding (RIPPS)
Plant Health Programs (PHP)
Plant Protection and Quarantine (PPQ)
USDA APHIS
Bldg. 580, Powder Mill Road, Beltsville, MD 20705
Phone 301-313-9317
Email jorge.a.abad@aphis.usda.gov

Introduction

The mission of the Potato Quarantine Program (PQP) is to test germplasm for pathogens as a condition for the entry of this valuable plant into the United States. Special emphasis is given to the detection of viruses, viroids and bacteria including phytoplasmas. This program is the first line of defense against the inadvertent introduction of new potato diseases into the USA. Such diseases have the potential to create both economical and environmental burden to the crop. In addition, in our program, any infected material is subjected to therapy for the elimination of pathogens and then retested to ensure the success of the treatment. In the end, all the accessions received in our program are released to the requesters. Moreover, PQP has a strong and an efficient collaboration with the NRSP-6 promoting: the acquisition, sanitation and further use of clean germplasm.

Accomplishments

Our PQP continue keeping very high standards in pathogen detection tests for potato diseases. We use a sound biological test under optimum conditions that ensures the interception of unknown or unusual viruses. This test includes the inoculation onto 14 different indicator plants and grafting on healthy potatoes. ELISA and the molecular based methods that we currently use will not detect those viruses. Among the molecular tests, we routinely use RT-PCR and PCR with generic primers for: luteoviruses, carlaviruses, potexviruses, potyviruses, geminiviruses and phytoplasmas. We finally are going to use a qRT- PCR (real time) test to detect *Potato yellow vein virus*, a potentially damaging and seed transmitted virus.

Our primary stakeholders continue to be potato breeders from universities, government and the private industry. Interestingly, this season we continued introducing true potato seed (TPS) for private growers. In this occasion, *Solanum acaule*, a wild potato that tolerates frost, was imported. The requestor works for a non-profit organization promoting ecological gardens in Indiana. Those seeds will be used to produce potato plants as part of a larger community of plants in such gardens. We are also continuing our collaboration with the NRSP-6 US Potato Genebank by introducing more potato accessions through our quarantine program. This season, five accessions from Peru, three from Japan and one from Germany were imported for the Genebank. In addition, as part of our continuing collaboration, six accessions already introduced into the collection at the Genebank are undergoing therapy to eradicate PVS in our tissue culture lab. These accessions were placed in thermotherapy and chemotherapy; the clones will be maintained in tissue culture until they have generated sufficient material for testing. After testing is complete and the accessions are found to be negative for PVS, they will be released back to the Genebank in about eight more weeks.

Clonal Testing at the Potato Quarantine Program

Table 1 show that there were 81 potato clones in the PGQP in the 2011-2012 season. From those, 75 clones were received this season; 10 accessions as tubers and 65 as *in vitro* cultures. The remaining 6 clones were obtained the previous years. So far, 49 clones were already released, 13 clones were infected and sent to therapy and 18 remain under testing. This season was unusually long and due to unpredicted changes in the weather, some tests needed to be repeated.

Summary 2011-2012 Potato Season

Clonal Potatoes

There were 81 potato clones in the PGQP in the 2011-2012 season.

3 clones were received in 2009

3	from Chile	for G. Secor

3 clones were received in 2010

2	from Spain	for M. Martin
1	from Japan	for C. Brown

75 clones were received in 2011

65 were received *in vitro*

19	from Chile	for G. Secor
6	from France	for K. Perry
8	from Germany	For J. Bragg
1	from Germany	For T. Lubberstedt
1	from Germany	for M. Martin
9	from Germany	for Summit Plant Labs
13	from New Zealand	for C. Brown
5	from Peru	for M. Martin
3	from Scotland	for D. Ronis

10 clones were received In 2011 as tubers

3	from Japan	for M. Martin
7	from Ireland	for C. Higgins

Of these 81 clones:

1 was too small to test and was held until next season

80 were tested

13	were positive
18	are still being tested
49	were released

(PLRV, Potyvirus and PVS were intercepted this season)

True Potato Seed

There was 1 TPS lot tested in the PGQP in the 2011-2012 season.

1 Grown and tested at PGQP

1	from Peru	for F. McColly

The seed lot was released.

2012 OFFICE OF NATIONAL PROGRAMS REPORT

FOR THE U. S. NATIONAL PLANT GERMPLASM SYSTEM

OFFICE OF NATIONAL PROGRAMS, NATIONAL PROGRAM 301: PLANT GENETIC RESOURCES, GENOMICS, AND GENETIC IMPROVEMENT

(PETER BRETTING, DAVID MARSHALL, JACK OKAMURO, SALLY SCHNEIDER, ROY SCOTT, GAIL WISLER, DA KAY SIMMONS)

1 **Personnel changes:**

1.1 Farewell and best wishes to Mark Widrlechner who retired as Horticulturist and woody ornamental plant curator at Ames, IA; Ray Schnell, who retired as Research Geneticist and tropical fruit crop and sugar cane curator at Miami, FL; Steve Clement, who retired as Research Entomologist at Pullman; Chuck Simon, who retired as Grape Curator at Geneva; Ray Mock, who retired as a Plant Pathologist at NGRL, Beltsville, MD and Doug Cook who retired as IT specialist at Corvallis.

1.2 Welcome to Thomas Chao, new grape, apple, and tart cherry curator at Geneva, NY; Noelle Barkley, new peanut curator at Griffin, GA; Osman Gutierrez, cacao Research Geneticist at Miami, FL; Hugo Cuevas, new sorghum Research Geneticist at Mayagüez, PR; and Pablo Jourdan, new director of the Ornamental Plant Germplasm Center, Columbus, OH. Roy Pittman, formerly peanut curator, assumed responsibility for the cowpea (Vigna) collection at Griffin.

2 **Site developments and changes:**

2.1 The USDA/ARS-NPGS partnered with Bioversity and the GCDT on a three-year, $1.4 million project to transform GRIN into GRIN-Global, a powerful but easy-to-use, Internet-based, plant genetic information management system that will link world's plant genebanks. NPGS personnel in Beltsville, MD and Ames, IA are leading the project. The nucleus of the system is ARS's existing GRIN, which already houses information about the more than 546,000 accessions of more than 14,000 plant species in the NPGS. Software upgrades will enable GRIN be used by genebanks of all sizes from many countries, making more information about more plants available to researchers. GRIN-Global v. 1.0 was released to the international community in December 2011. It will be implemented within the NPGS starting in late 2012.

2.2 For many elite vegetatively-propagated genebank accessions, cryopreservation of shoot tips or dormant buds is often the most secure and cost-effective means for long-term conservation. Cryopreservation protocols have traditionally been developed empirically, because the underlying physiological genetic process of regrowth following cryopreservation has been poorly understood. ARS researchers in Fort Collins, Colorado discovered some of the first physiological genetic details of how plant shoot tips recover from cryopreservation treatments. Shoot tips dehydrated with cryoprotectants, exposed to liquid nitrogen, and allowed to recover, expressed stress-related genes such as

heat shock proteins, antioxidants, dehydrins and other physiological "housekeeping genes." This research is a key breakthrough in understanding the genetic and biological bases of variation among genotypes in their response to cryopreservation treatments, as well as their response to therapeutic treatments for recovering germplasm from cryogenic storage.

2.3 Knowledge of geographical patterns of genetic variability is vital for efficient and effective management of genetic resources in situ and ex situ in genebanks. ARS researchers in College Station, Texas developed new DNA genetic markers for pecan (which also function with walnuts) which can reveal geographical patterns of genetic diversity and evidence of hybridization. To date, these new genetic tools have confirmed a lack of reproductive isolation for wind-pollinated pecans, and have contributed to the development of strategies for the safe introduction of new pecan species from Asia that might contribute genes for genetically improving the U. S. pecan crop, which has an annual farm gate value of hundreds of millions of dollars.

2.4 High concentrations of oleic acid in the seeds are beneficial attributes for peanut, a globally important food legume and oilseed. ARS researchers in Griffin, Georgia, developed a real-time polymerase chain reaction genotyping assay for alleles of genes governing the high oleic acid trait in peanuts. This assay enables curators to identify particularly valuable accessions, and breeders to test seed or leaf tissue rather than via destructive chemical analyses of ground seeds. This rapid assay will help identify key genotypes linked to important agronomic traits, improve curatorial efficiency, and accelerate characterization of the progeny of peanut breeding crosses by eliminating undesirable seedlings.

3 Budgets:

3.1 The current Administration's research priorities for USDA include climate change, food safety, children's nutrition/health, international food security, and bioenergy.

3.2 The President's FY 12 budget proposed substantial budget increases ($3.3 million) for the NPGS. The FY 12 budget enacted by Congress did not include those increases. On the contrary, it reduced the USDA/ARS's budget by about 3.5%. Nine locations and one program will be closed, including the NPGS genebank at Palmer, AK. Closing the preceding locations will likely cost ARS an additional ca. $30 million or more for FY 12. The FY 12 budget reduction, on top of last FY's reduction, will substantially affect the ability of some NPGS genebanks to address their objectives. The President's FY 13 budget, announced on 13 Feb. 2012, proposes modest budget increases ($581,000) for the NPGS. The proposed FY 13 House budget does not include specific details for ARS's budget, but it would reduce overall Federal government spending substantially.

4 National Programs:

ARS's research portfolio is organized as a series of 18 national programs. Plant and microbial genetic resource management, genetic improvement, genomics, molecular and biological processes, biotechnology risk assessment, bioinformatics, and genome database management are incorporated into National Program 301 (see the WWW at: http://www.nps.ars.usda.gov/programs/programs.htm?NPNUMBER=301). During 2011, NP 301 completed its second five year cycle. Its accomplishments are described in the 2006-2011 NP 301 Accomplishment Report available on the web at: http://www.ars.usda.gov/research/programs/programs.htm?np_code=301&docid=22191 During late October 2011, NP 301 underwent an external review which in general found that the NPGS was performing high-quality research and service programs with significant impact (see Executive Summary of the panel review at the web site above). The external review was followed by teleconferences-webinars on 8 and 9 November 2011 to inform scientists and customers-stakeholders of the review results. A customer/stakeholder workshop was held in Beltsville on November 15, 2011 to elicit input regarding future research needs and priorities. ARS leaders and researchers developed an Action Plan for the next five years of NP 301 research (see http://www.ars.usda.gov/SP2UserFiles/Program/301/NP%20301%20Action%20Plan%202013-2017%20FINAL.pdf , and are holding ARS scientist teleconferences in 2012 as a prelude for developing individual Project Plans.

5 National Plant Germplasm Coordination Committee (NPGCC):

The NPGCC seeks to promote a stronger, more efficient, more widely-recognized and better utilized NPGS. Its goals are to facilitate the coordination of ARS, NIFA and SAES planning and assessment mechanisms for NPGS policy, organization, operations and support; promote awareness and understanding of the NPGS across ARS, NIFA, and SAES and more broadly to the scientific community; and serve as a vehicle for improving communications and discussions about issues impacting the NPGS with ARS, SAES, and NIFA. It will assess, develop and recommend to the SAES, ARS and NIFA strategies for improved coordination of NPGS activities; develop and recommend a process for improved communication of the value of the NPGS; initiate a strategic planning effort for the NPGS to better define and communicate the vision, mission and short- and long-term goals; and to evaluate the current funding models for the NPGS and report findings to the SAES directors, ARS and NIFA.

The current members of the NPGCC are L. Sommers (Colorado State-SAES), Chair; E. Young (Executive Director, Southern Region); J. Colletti (Iowa State-SAES), G. Arkin (University of Georgia-SAES), T. Burr (Cornell University-SAES), A. M. Thro (NIFA), E. Kaleikau (NIFA), P. S. Benepal (NIFA), P. Bretting (ARS-Office of National Programs), D. Upchurch (ARS-Southern Plains Area), and G. Pederson (ARS-Griffin).

NPGCC members made a joint presentation on the NPGS to the 2006 Experiment Station Section/State Agricultural Experiment Station/Agricultural Research Directors Workshop September 24-27, 2006. That presentation, plus testimonials from key Directors about the

NPGS's value, increased the NPGS's visibility to this important group. In May 2007, the NPGCC recommended to the National Research Support Project Review Committee that it recommend restoring off-the-top funds designated for NRSP-5 (the Prosser, WA virus-free pome and stone fruit project) and NRSP-6 (the potato genebank project at Sturgeon Bay, WI) to their FY 06 levels to sustain these valuable efforts. Support for NRSP-6 has been maintained at the FY 06 level for FY 07, FY 08, and FY 09. The NPGCC met on June 5, 2008, in conjunction with the annual PGOC and biennial CGC Chairs meetings. It discussed the NPGS's budget levels, funding for NRSP-5 and NRSP-6, the location of crop collections, and mechanisms for publicizing the NPGS. Similarly, the NPGCC met on 23-24 June 2009, 9 June 2010, and 16-17 June 2011 in Beltsville, MD to continue its work on these priority issues.

6 International germplasm items:

The FAO Treaty (IT) for Plant Genetic Resources for Food and Agriculture came into force on 29 June 2004, and beginning in 2007 its standard material transfer agreement (SMTA) for plant genetic resource exchange was adopted by Parties to the IT and the CGIAR Centers for distributing plant genetic resources. On 7 July 2008, the White House transmitted the IT to the Senate; ratification would require the advice and consent of a 2/3 majority of the Senate. The Senate Foreign Relations Committee (SFRC) held hearings on the IT on 10 November 2009. During their last Business Meeting of the 111th Congress (30 November 2010), the SFRC voted the IT out of committee, for consideration by the full Senate. Unfortunately, the Senate adjourned on 22 December 2010 without voting on the IT. The SFRC might schedule new hearings on the IT during 2012, as a prelude to the full Senate for a vote for consent (or not) to IT ratification.

Concurrently, the Convention on Biodiversity (CBD) adopted the voluntary, non-binding Bonn Guidelines on Access and Benefit-Sharing during the sixth Conference of Parties (COP-6) of the CBD at The Hague in April 2002. Starting in 2006, Parties to the CBD began negotiating what became the legally-binding Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization. Adopted by the COP-10 on 29 Oct. 2010, the Nagoya Protocol is quite complicated, with many ambiguous components; its ramifications are currently under analysis (see http://ictsd.org/downloads/2010/11/abs-protocol.pdf for the text).

The preceding developments at FAO and with the CBD will substantially affect international exchange of plant genetic resources, and the NPGS, whether or not the U. S. is ultimately a Party to either or both treaties. Precisely how these treaties will affect U. S. users of germplasm depends on the treaties' implementations.

Use of NRSP-6 Accessions for Research by USDA/ARS researchers.
Annual Report 2012, College Station, Texas. Technical Advisory Committee.

The ever-evolving holdings of the NRSP-6 Program continue to serve as the raw material for mission driven and idea-driven research. This includes basic research on what is the nature of a species in tuber bearing Solanum and attempts to find resistance to emerging and devastating disease and pest problems.
The introduction of potato and its subsequent adoption outside of its center of origin occurred in the virtual absence of biosystematics information surrounding potatoes. With the first expeditions by Russian scientists in the 1930's and the extensive career-long research of Jack Hawkes, a solid and comprehensive foundation was set. In the last two decades the techniques of numerical and molecular taxonomy have lead to new discoveries and greater insight into the perennial question of what is a wild and cultivated potato species. The impact on the science of potato breeding is considerable.

The following shipments were sent to ARS scientists in 2011.

ORNO	LNAME	FNAME	ORG	CITY	STA	EMAIL
2011162	Baker	Dr. Barbara	University of California	Albany	California	bbaker@berkeley.edu
2011003	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011004	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011009	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011014	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011016	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011018	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011066	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011079	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011096	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011097	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011103	Bamberg	Dr. John	USDA,	Sturgeon	Wisconsin	john.bamb

			ARS	Bay		erg@ars.usda.gov
2011111	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011134	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011159	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011160	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011165	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011166	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011176	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011177	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011212	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011215	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011216	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011222	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011087	Bamberg	Dr. John	USDA, ARS	Sturgeon Bay	Wisconsin	john.bamberg@ars.usda.gov
2011114	Barnett	Brittany	USDA-ARS	Fort Collins	Colorado	brittany.barnett@ars.usda.gov
2011098	Brown	Dr. Chuck R.	USDA, ARS	Prosser	Washington	chuck.brown@ars.usda.gov
2011115	Brown	Dr. Chuck R.	USDA, ARS	Prosser	Washington	chuck.brown@ars.usda.gov
2011118	Brown	Dr. Chuck R.	USDA, ARS	Prosser	Washington	chuck.brown@ars.usda.gov
2011133	Brown	Dr. Chuck	USDA,	Prosser	Washingto	chuck.bro

		R.	ARS		n	wn@ars.usda.gov
2011223	Brown	Dr. Chuck R.	USDA, ARS	Prosser	Washington	chuck.brown@ars.usda.gov
2011235	Brown	Dr. Chuck R.	USDA, ARS	Prosser	Washington	chuck.brown@ars.usda.gov
2011007	Halterman	Dr. Dennis	University of Wisconsin	Madison	Wisconsin	dennis.halterman@ars.usda.gov
2011030	Hamernik	Mr. Andy	University of Wisconsin	Madison	Wisconsin	hamernik@wisc.edu
2011069	Haynes	Dr. Kathy	USDA, ARS - Vegetable Laboratories	Beltsville	Maryland	kathleen.haynes@ars.usda.gov
2011210	Haynes	Dr. Kathy	USDA, ARS - Vegetable Laboratories	Beltsville	Maryland	kathleen.haynes@ars.usda.gov
2011218	Ingram	Jason Timothy	USDA, ARS - Cornell University	Ithaca	New York	jti2@cornell.edu
2011005	Jansky	Dr. Shelley	USDA - ARS	Madison	Wisconsin	shelley.jansky@ars.usda.gov
2011063	Jansky	Dr. Shelley	USDA - ARS	Madison	Wisconsin	shelley.jansky@ars.usda.gov
2011070	Jansky	Dr. Shelley	USDA - ARS	Madison	Wisconsin	shelley.jansky@ars.usda.gov
2011191	Jansky	Dr. Shelley	USDA - ARS	Madison	Wisconsin	shelley.jansky@ars.usda.gov
2011202	Jansky	Dr. Shelley	USDA - ARS	Madison	Wisconsin	shelley.jansky@ars.usda.gov
2011238	Jansky	Dr. Shelley	USDA - ARS	Madison	Wisconsin	shelley.jansky@ars.usda.gov
2011221	Jenderek	Maria M.	USDA, ARS - NCGRP	Fort Collins	Colorado	maria.jenderek@ars.usda.gov
2011232	Jenderek	Maria M.	USDA, ARS - NCGRP	Fort Collins	Colorado	maria.jenderek@ars.usda.gov
2011187	McCue	Dr. Kent	ARS - Western Regional	Albany	California	kent.mccue@ars.usda.gov

			Res. Center			
2011034	Navarre	Dr. Duroy A.	USDA, ARS - Washington State University	Prosser	Washington	roy.navarre@ars.usda.gov
2011197	Navarre	Dr. Duroy A.	USDA, ARS - Washington State University	Prosser	Washington	roy.navarre@ars.usda.gov
2011207	Navarre	Dr. Duroy A.	USDA, ARS - Washington State University	Prosser	Washington	roy.navarre@ars.usda.gov
2011213	Navarre	Dr. Duroy A.	USDA, ARS - Washington State University	Prosser	Washington	roy.navarre@ars.usda.gov
2011188	Romano	Dr. Gabriela	USDA, ARS	Parlier	California	gabriela.romano@ars.usda.gov
2011091	Simko	Dr. Ivan	USDA-ARS	Salinas	California	ivan.simko@ars.usda.gov
2011153	Simko	Dr. Ivan	USDA-ARS	Salinas	California	ivan.simko@ars.usda.gov
2011156	Simko	Dr. Ivan	USDA-ARS	Salinas	California	ivan.simko@ars.usda.gov
2011011	Spooner	Dr. David	USDA - ARS	Madison	Wisconsin	david.spooner@ars.usda.gov
2011190	Spooner	Dr. David	USDA - ARS	Madison	Wisconsin	david.spooner@ars.usda.gov

Some further details are provided concerning each scientist's project where made available.

USDA-ARS Potato Germplasm Enhancement, Madison, WI
Shelley Jansky, April 2012

- Characterization of effects of haploid and wild species parents on fertility, tuber, and stolon traits of haploid-wild species hybrids.

Jansky, S.H. 2011. Parental effects on the performance of cultivated x wild species hybrids in potato. Euphytica. 178:273-281.

- Identification of new sources of resistance to potato virus Y.
  Cai, X., D.M. Spooner, and S.H. Jansky. 2011. A test of taxonomic and biogeographic predictivity: Resistance to potato virus Y in wild relatives of the cultivated potato. Phytopathology. 101:1074-1080.
- Evaluation of tuberization in haploids, wild species, and hybrids in response to photoperiod.
  Kittipadukal, P., P.C. Bethke, and S.H. Jansky. 2012. The effect of photoperiod on tuberization in cultivated × wild potato species hybrids. Potato Research (DOI 10.1007/s11540-011-9204-3).
- Identification of a new source of resistance to early blight.
  Weber, B. and S.H. Jansky. 2012. Resistance to *Alternaria solani* in hybrids between a *Solanum tuberosum* haploid and *S. raphanifolium*. Phytopathology. 102(2):214-221.
- Evaluation of the effects of seed treatments on germination.
  Jansky, S., Hamernik, A. and Cai, X. 2012. Rapid cycling with true potato seed. Seed Science and Technology. 40:43-50.
- Germplasm Release: Clone M6, a fertile, self-compatible inbred clone of *S. chacoense*.
- Germplasm Release: Clone M7, a long, russet, tetraploid clone that resulted from bilateral sexual polyploidization in a hybrid between *S. tuberosum* and *S. infundibuliforme.*
- Scab resistance in haploid x *S. chacoense* F1, F2, and BC families
  - Have been phenotyped in field and greenhouse
  - SNP genotyping has been carried out in F2 family
- Calcium uptake in tubers of *S. microdontum* x *S. kurtzianum* F2 family
  - Phenotyping has been carried out in greenhouse trials
  - AFLP and SSR genotyping is underway
- Verticillium wilt resistance
  - *Ve* gene sequence variability had been determined in wild species selected for resistance and susceptibility to *Verticillium dahliae* to refine the existing molecular marker

David Spooner. Use of NRSP-6 stocks, 2012.

Chung, Y.S., K. Holmquist, D.M. Spooner, and S.H. Jansky. 2011. A test of taxonomic and biogeographic predictivity: resistance to soft rot in wild relatives of cultivated potato. Phytopathology 101: 205-212.

Cai, X. K., D. M. Spooner, and S. H. Jansky. 2011. A test of taxonomic and biogeographic predictivity: Resistance to potato virus Y in wild relatives of the cultivated potato. Phytopathology 101: 1074-1080.

- Khiutti, A., O. Afanasenko, O. Antonova, O. Shulavov, L. Novikova, E. Krylova, N. Chalaya, N. Mironenko, D. M. Spooner, T. Gavrilenko. In press. Characterization of

resistance to *Synchytrium endobioticum* in cultivated potato accessions from the collection of Vavilov Institute of Plant Industry (VIR). Plant Breeding.

- **The above three papers examine, through disease screens in wild and cultivated potato species, the ability to use taxonomy, biographical data, ploidy, and breeding traits as reliable predictors to select for such disease traits in lieu of intensive disease screening.**

Ovchinnikova, A., E. Krylova, T. Gavrilenko, T. Smekalova, M. Zhuk, S. Knapp and D. M. Spooner. 2011. Taxonomy of cultivated potatoes (*Solanum* section *Petota*: Solanaceae). Bot. J. Linn. Soc. 165: 107-155.

- **This paper revises cultivated potato taxonomy, placing over 600 names in synonymy, and justifies the new taxonomy through a summary of prior studies.**

Fajardo, D., and D. M. Spooner. 2011. Phylogenetic relationships of *Solanum* series *Conicibaccata* and related species in *Solanum* section *Petota* inferred from five conserved ortholog sequences. Syst. Bot. 36: 163-170.

- **This paper uses DNA sequence data of six nuclear orthologs to show the need to reduce the number of wild potato species in *Solanum* series *Conicibaccata*.**

Spooner, D. M. 2011. The significance of field work in monographic studies. in: T. Stuessy & W. H. Lack (eds.), Monographic Plant Systematics: Fundamental Assessment of Plant Biodiversity. A. R. G. Gantner, Ruggell, Liechtenstein. Regnum Veg. 153: 25-32.

- **This paper uses results from potato, and in other groups, to document the value of field work for taxonomy.**

Rodríguez, F., D. Cai, Y. Teng, and D. M. Spooner. 2011. Asymmetric single-strand conformation polymorphism: an accurate and cost-effective method to amplify and sequence allelic variants. Amer. J. Bot. 98: 1061-1067.

- **This paper uses potato to develop an accurate and inexpensive method (relative to cloning) to separate allelic variants of DNA sequences.**

Simon, R., A. F. Fuentes, and D. M. Spooner. 2011. Biogeographic implications of the striking discovery of a 4000 kilometer disjunct population of the wild potato *Solanum morelliforme* in South America. Syst. Bot. 36: 1062-1067.

- **This paper documented the occurrence of this potato species in a new continent, fully 4000 km far from all previously known occurrences. It also showed the value of geographic information system analyses to explore such disjunct occurrences.**

Egan, A., J. Schlueter, and D. M. Spooner. 2012. Applications of next-generation sequencing in plant biology. Amer. J. Bot. 99: 175-185.

- **This is a summary paper of a special volume of American Journal of Botany on the use of next generation sequencing for the botanical sciences. No potato NRSP-6 stocks were used in this analysis, but preliminary work of co-author Spooner were used for ideas to construct this paper.**

Spooner, D.M., S. Jansky, A. Clausen, M. del Rosario Herrera, and M. Ghislain. 2012. The enigma of *Solanum maglia* in the origin of the Chilean cultivated potato, *Solanum tuberosum* Chilotanum Group. Econ. Bot. 66: 12-21.

- **This paper uses starch grain analysis and nuclear microsatellites to investigate the origin of *Solanum maglia* in the origin of Chilean landrace potato cultivars.**

Spooner, D.M. In press. *Solanum tuberosum* (potato). Encyclopedia of Genetics, 2nd Edition, eds. S. Maloy & K. Hughes, Elsevier.

- **This paper revises a prior paper in this encyclopedia on the taxonomy and disease resistance and breeding diversity of potato.**

Ivan Simko. Use of NRSP-6 materials. 2012.

This material will be used to analyze Verticillium resistance genes in different plant species. So far we are in the stage of growing plants and extracting.

Chuck Brown. Use of NRSP-6 stocks. 2012.

Ultra-High Carotenoid potato at tetraploid level. The allelic composition of potatoes for expression of requires that a beta-carotene hydroxylase be present in at least one dosage while the a zeaxanthin epoxidase be present in quadriplex because it is recessive to other alleles. In a population breeding approach the recovery of such individuals is at a very low level. The introduction of zep into a population is accompanied by lack of expression initially and followed by expression at a 2 percent incidence. Besides increasing carotenoid levels for health and novelty reasons, there is a taste difference. Applying this to the processing industry, if very dark yellow potatoes with low sugars could be developed, it is likely that the golden color that is achieved by leaching of sugars and re-adding dextrose (an acrylamide raising practice) could be avoi ded and the golden color imparted by carotenoids alone would be sufficient. There are two photos below that show examples of showing the golden color zexanthin content. NRSP- played a key role in research. PAL08PG21 is a diploid while C 51 was tetraploid.

2

UHC potatoes that fry well, that is solely due to high stocks and personnel providing materials for this was selected in Alaska and selected in Prosser and is a

In 2006, the pale cyst nematode was found Idaho. During the last six years a multimillion dollar fumigation project has been carried out to eradicate the nematode. Research on alternative measures was carried out in parallel. One of these was to search for trap crops. The genus Solanum has provided a successful group of materials to search in. Trap crops have the characteristic that they incite hatching of the eggs, that are housed in cysts. At the same time they are not hosts for the nematode and the juveniles emerging from the eggs soon starve and die. Hence a species which strongly induces egg hatching while allowing virtually no

reproduction is the key. For practical considerations it must be a plant that can grow vigorously in the target environment and is amenable to manipulation at planting, during growth, and at the end of the season.

So far the following *Solanum* spp. Are potential trap crops. *S. sisymbriifolium, S. aethiopicum, S. quitoense, S. lycopersicoides* and *S. circaeifolium.* The last in the list is the only tuber-bearing *Solanum*. It also offers the possibility of the production of triploid hybrids that could be propagated vegetatively and not produce seed in the field. Technically the *S. sisymbriifolium* will be trialed on a large scale this year in Idaho and to a lesser extent in pots at various locations. An interesting side point is that *S. sisymbriifolium* is resistant to *Meloidogyne chitwoodi*, powdery scab, and late blight. In the area of interest of cleaning up fields such an array of resistances might prove useful for non-chemical disease and pest control in the future. The roots of *S. sisymbriifolium* are used in Paraguay as a treatment for hypertension. At Prosser we have carried out several generations of selection for reduced spininess with success. We anticipate the release of this selected synthetic as a germplasm or named variety in the future.