Contents:

NRSP-6 TAC 2011 MINUTES

NRSP6 TAC meeting hosted by Potato Genebank, Sturgeon Bay, WI,
June 28, 2011

Walter DeJong, Chair, NRSP-6 TAC '11
Creighton Miller, Vice- Chair, NRSP-6 TAC '11
Fahrettin Goktepe, Secretary, NRSP-6 TAC '11

The meeting was called to order at 8:20 a.m.

ATTENDANCE

Present: Richard L. Lindroth, Phillip Simon, Larry Chandler, Ed Ashworth, John Bamberg, Jiwan Palta, Walter DeJong, Fahrettin Goktepe, Bob Hoopes, Shelley Jansky, Max Martin, Jesse Schartner, Creighton Miller, Alfonso del Rio, David Douches, Jorge Abad

On Conference Call: Peter Bretting, Chuck Brown, Benoit Bizimungu, David Spooner

The meeting started with a welcoming speech by Richard Weidman, Superintended of the Peninsular Research Station (University of Wisconsin). Weidman summarized some background information about the research station.

- The research station was in service since 1922
- The station currently has 4 Full time FTE
- The station owns about 120 acres land
- The Peninsular Station is also home to the NRSP-6, US Potato Genebank
- The station has research about tree ,small fruits and it is facilitated with online weather station network, real-time weather data, serve the community for horticultural crops

BUSINESS

Preliminaries

1. There were no announcements
2. There was a change to the Agenda. Chair proposed to move item # 10, 11 right after item #6. Miller moved to accept, it was seconded it by Simon and the change was accepted.
3. Minutes of the 2010 meeting were reviewed. Bamberg commented on follow up regarding 2010 meeting decisions: Clonal collection was virus tested.
4. Chair appointed Resolutions Comm: Jansky, with input from Miller

5. Lead AA:

Rick Lindroth, the Lead AA and Associate Dean went through budgetary items. At the end of his report, Lindroth indicated that there is currently no plan for permanent closure due to the budget cuts however; there is a possibility to make some shifts in the programs. There was a question in regards to what will happen to the potato genebank if the research station

is shut down. It was emphasized that potato genebank greatly relies on greenhouses, fields and other facilities at this station.

The following is Lindroth's complete report:

The single factor that has dominated our work over the last 6 months has been budget cuts – at the federal, state, and university levels. At the federal level, we've seen what is likely to be a permanent loss of earmark funding, including losses to a number of ag-related projects and programs. The UW has had a policy to not pursue earmark funding, so our losses are not great, but they are still substantial to some programs (e.g., the Babcock Institute for International dairy research and development). Projections for future federal support of ag-related research are grave: the House of Representatives passed its Agriculture bill a few weeks ago. It includes deep cuts to USDA R&D, including a 12.9% ($146 million) cut from FY 2011 funding levels to the intramural Agricultural Research Service; a 16.7% ($203 million) cut to the National Institute of Food and Agriculture (NIFA); and within NIFA, a 13.9% ($37 million) cut to the competitive, extramural Agriculture and Food Research Initiative. Notably for our interests, the House Ag bill has a cut of $28 million to Hatch (12%).

At the state level, our new governor vowed to eliminate a $3 billion deficit without raising taxes. That resulted in a $250 million cut to the University of Wisconsin System, with ~$95 million at UW-Madison.

We still don't know what the cut will be to the UW College of Agriculture and Life Sciences. We are preparing for a cut in the range of $1-3 million. The most recent information was that the cut would be at the high end, which represents 7.1% of our state-funded budget. To absorb that cut by not firing faculty, (and not filling a number of faculty vacancies) means cuts of ~15% to non-faculty, state-supported entities.

Where this information intersects with this committee is with respect to CALS Agric Research Stations. They will likely be hit with a 15% budget cut, on top of a 10% cut in the last budget cycle. There is no way that the system can absorb that magnitude of cut, so the CALS deans team is looking into merging some programs and staff, and potentially closing some stations. So, for example, there's a very real possibility that the potato breeding program will move from Rhinelander to Hancock station.

No decisions have been finalized about closing any station, and no station will be closed this year. But Peninsular is one that has been identified as a likely candidate for "mothballing".

Finally, the major budget issue that is confronting NRSP6 is transitioning off of the OTT pass-through funds. There seems to be some discrepancy in terms of understanding of the long-term nature of NRSP funding, but the current NRSP committee does not view NRSP funds as a stable source of long-term funding for projects. They view them as start-up funds to get projects up and running, after which the projects will transition to other sources of funds. That is the challenge that lies before NRSP6, and one that John, Phil Simon and I have been wrestling with the last few weeks. (Since we were notified by Arlen Leholm that we needed to document private sources of funding for *this* year, or risk not having funding approved.)

Lindroth report was followed by a serious discussion about the NRSP6 budget uncertainty.

Ed Ashworth, Regional AA, understands that there are budgetary frustrations. He proposed the possibility of rolling the potato genebank budget into the North Central Regional budget then the money can be reallocated to potato genebank. Bretting indicated

NRSP6 review committee has certain criteria to apply and it looks different than the regional project. Bretting also indicated that it may not be easy to roll NRSP6 budget into a regional genebank budget because University of Wisconsin pays for some. Miller emphasized that we have to propose a permanent solution, because every year we are facing the same issue. Miller asked Bretting what would be his suggestions for a long term solution. Bretting respond it that he did not know an easy solution, but whatever we do; we have to stay on course. He also indicated that they have conducted an intensive study in Lake Tahoe in 2006, and there was a unanimous agreement to continue supporting both regional and potato genebank. Last year, the project was renewed for 5 years but that doesn't guarantee that the money will be there for upcoming years. Lindroth pointed out that since NRSP review committee is going to meet next week, we don't have enough time to review the funding structure so we need to move forward to secure the funding and keep the doors open. The question was about how the NRSP review committee functions. Bretting attempted to reach Erik, so he can provide the committee with some information about the nature of review committee and how they function, but Erik wasn't available. Once the review committee sets and approves the budget, it will go to the NRSP technical advisory committee including Experiment Station Directors who will meet in September.

6. Other regional AAs

7. **NRSP-6 Report** – Bamberg (Annual Report, CY10 to date appended and pdf posted on genebank website)

   Report was a PowerPoint presentation. Adele Douglass has received the Potato Genebank Special Recognition award. Annual report is structured by genebank mission area.

   - Acquisition and associated works: Collecting in US to stock genebank and R&D type work. Two potato species are native to US. Bamberg and del Rio were on an expedition to collect these native species in 2010 in the Santa Rita Mountains.
   - Collections: Need to look at what is available outside or in different countries and goal is to bring them in and evaluate them for different traits. Roy Navarre is currently testing a high antioxidant clones. Continue to collaborate with other genebanks.

- There was a question about if the open pollinated seeds would be a problem to maintain the original sources. Max responded that *S. andigena* collections are generally tubers so we maintain the original source. David Spooner : there is a certain degree of outcrossing, prefer to use materials for which we know the parentage. Chuck Brown: dominant traits are easy to recover, the traits with low heritability and epistatic interactions might be lost. Walter De Jong: as long as the alleles are present, we can recover the targeted ones. Shelley Jansky asked if inbreeding depression would be a concern. John Bamberg indicated that USPG received most of these material as TPS, so the original clones to which descriptive data was attached had already been compromised. Bob Hoopes suggested that if we don't have the original clones, it is better to maintain open pollinated seeds. Walter De Jong added that open pollinated seeds would be the cheapest way to maintain alleles.

- Bamberg recounted a recent success story as a model for how the genebank promotes germplasm use: Roy Navarre asked for a certain high antioxidant clone we did not have. We found it would take up to two years to obtain it from CIP and through Quarantine. We suggested screening some of the primitive cultivars already in USPG. We used pre-existing characterization data to select 100 populations, making screenhouse tubers of 15 seedlings each. Max preselected these tubers and sent 100 to Roy Navarre, who did the antioxidant analysis. One clone was identified with phenomenal levels of antioxidants—higher than reported in any previous potato, as reported at the 2010 Potato Association of America meeting in Corvallis Oregon last August.

John also highlighted few specific research projects on the collected germpasm -*S. jamesii* anti-prostate cancer property, anticancer tomatine, potato-unique satiety protein, resistance to tuber greening after illumination in *S. microdontum*.

- Preservation: 235 seed increase. Have about 4,500 seed (200/year for 20-year cycle). Involves disease and viability monitoring.

8. ARS:

David Spooner: CIP is collecting now but they are not allowed to distribute materials.

Chuck Brown:
1st part of his project: Extraction of Colombia root knot nematode resistance from potato gene bank materials, the clone (BC5) with potential resistance graduated through western regional trials. This clone is also resistant to black dot, pink rot and among all white flesh potato tested, it has the highest total phenolic. 2nd part of his project: searching for super high carotenoids, Papa Amarilla type potato, difficult to move out the genes for high carotenoids from these potatoes due to the strong linkage with a lack of dormancy. With help of molecular markers and intensive studies, a tetraploid (orange flesh) potato with dormancy was developed. Black Dot: One of the main problems for the region, Verticilium vs black dot, in terms of soil born diseases, black dot is the new main problem for Pacific Northwest Potato industry.

Shelley Jansky:
We are extensively using gene bank germplasm, few highlights from our studies;
Looking at cold sweetening, this work was published in PAA journal, currently creating new populations for genetic studies. Storage period; some materials were stored for 9 months and they are still looking great. Diploid hybrid; evaluating for late blight resistance. Tetraploid hybrid; evaluating for early blight resistant in red skin varieties and developing new population for early blight resistant. The question was what is the main source of early blight whether *Alternaria solani* was replaced by *Alternaria alternate?* Jansky responded that *A. solani* is still their main source of early blight. PVY resistance; a family derived from *S. chacoense* is presumably PVY resistant, it was interesting to see that the resistance was heat tolerant. The resistance is controlled by a single dominant gene and it is extremely resistant. *S. chacoense* could also be a source for scab resistance. 524-8 was identified to be scab resistance. Photoperiod and tuberization response is being studied. Amylose conten is relatively stable over all locations and during tuber development, but changes during the storage.

9. **NPL report**:
   Peter Bretting discussed the Office of National Programs Report, and personnel changes, retirements and open positions; the goal is to fill these positions in the near future. Rejuvenating the data base; the new version is going to be implemented in US next year. Budget; ARS lost essentially all of the earmarks and the loss of NPGS was about $700 thousand from FY10 funding level. The good news was that the President's FY12 budget proposes a substantial budget increase which is about $3.3 million. Bamberg asked Bretting if he could make some comment whether there were any discussion about possible charges for the germplasm materials. Bretting responded that the material is and will be free of charge. He referred to the NPGS policy which explains the reason why the materials are free of charges. In case of international shipping costs, Bretting indicated that it should be arranged between receiver and shipping company because ARS is not entitled to collect fees. Ed Ashworth added that NRSP6 budget is mainly salary in which less than 5% will be shipping and handling costs therefore covering the shipping costs will not make huge differences.

10. CSREES (Thro)
    Ann Marie Thro was in a trip to Afghanistan, couldn't attend the meeting.

11. Regional and ARS Technical Reports (submitted texts appended)

    Western Region:
    Fahrettin Goktepe reported that 586 units were distributed to the Western Region in 2010. Receiving states were CA, ID, OR, UT,HI and WA. Material was requested by universities, private companies and individuals.
    Private sector was very active, and materials were requested for different objectives including to evaluate for organic production. Materials were of good quality and received in good condition. Genebank materials users were very appreciative for the service they receive, they will continue to request these materials in the future and integrate into their research program to respond to their needs. Materials have been used for studies on: disease resistance, health attributes, molecular genetics, new cultivars for organic potato production, heat and drought tolerance, teaching and education. Roy Navarre (USDA/ARS) is currently screening potato genebank materials for asparagine content in raw materials and acrylamide content in finished products (winner of CGC evaluation grant for 2011).

    North Central Region:
    David Douches received an interesting phone call from a home owner gardener with some misleading information and a website about ecos purple potato. The claim was this purple potato can survive under freezing soil temperature in WI area. It was indicated that UW wasn't aware of such claim and there wasn't any scientific study to support this. [note: the likely explanation is that this is not a true potato at all]. Resistance for Colorado potato beetle is under investigation on the materials received from NRSP6 and the selections are being made through detached leaf bioassay and screen cages. SolCAP updates: SNP genotyped 10species selections that were submitted by Dr. Spooner. Tetraploid population for late blight and scab resistance. CIP sent 48 clones to look at the genetic diversity compare to US materials. Population study of Rio Grande Russet x Premier Russet from Rich Novy, and Atlantic x Superior from Jiwan Palta. A candidate PVY resistance gene in tomato or pepper especially in

tomato such as eIF4E could be useful for PVY resistance studies in potato. Jiwan Palta mentioned that clones from NRSP-6 genebank are being actively used to develop specialty type potatoes. Cold tolerance and cold respond in potato for frost resistance are being investigated in their program. Collaboration with CIP for calcium uptake in diploid and tetraploid level is in their trial studies.

North East Region:
Walter DeJong noted that the Northeast region received 647 units of germplasm, spread across 14 requests, in 2010.

These went to large universities and some small farms in NY and surrounding area. SolCAP is making genotyping easier. It is possible for someone to order SNP primers. The markers are user friendly for breeders. Identifying markers; if it is dosage sensitive, it is better to screen parental materials. Markers associated with general combining ability are useful. There was a recent article in Financial Times where Plant breeding is listed as one of the ten "hottest" fields in science. http://www.ft.com/intl/cms/s/2/bedd6da8-9d37-11e0-997d-00144feabdc0.html#axzz1QJurEHq4

Southern Region:
Creighton Miller reported seventeen orders in the Southern Region included a total of 129 accession, this was down significantly from 422 units ordered in 2009. Texas is currently using *Solanum jamesii* in human prostate cancer studies. Craig Yencho is working on heat necrosis, disease resistance such as early blight, powdery scab and Colorado Potato Beetle . He also stated that TAMU has already suffered from budget cuts. Miller has been ½ time for four years. Next year will be his last year to serve at NRSP6 committee. He was the only person working on potato for more than 35 years. Now, with Zebra Chip still the big issue, there are more than 20 working on some aspect of potato research. A major effort continued in 2010 involving research on the Zebra chip complex with emphasis on screening for host plant tolerance/resistance.

Agriculture and Agrifood Canada
Benoit Bizimungu reported 91units were ordered from genebank. AAFC is the main user, with major focus on incorporation of genetic resistance to pests such as Colorado potato beetle and diseases such as late blight, PVY, PLRV, *Verticillium* wilt. Most of the wild potatoes species they are using are ones native to Mexico. Increasing nutritional components with pigmented potatoes and starch composition are also being addressed in their studies. Fifteen new potato cultivars are being registered by Canada food agency. Two of those were from Agriculture and Agrifood Canada, the rest are mainly from Europe. Canadian plant genetic resources collection includes new cultivars, breeding lines and commercial cultivars.

12. **Industry Perspective**

Bob Hoopes stated that Frito-Lay has a long history of using NRSP-6 germplasm which is still going strong and has been quite successful in developing new clones. Frito-Lay crops out of FL, CA and TX and has developed clones which are adaptable to those areas. Long term storage like 9 months and reducing sugar for decent chip color is extremely important trait for Frito-Lay. Two clones, 440 & 438 developed by Shelley Jansky, are source of good chip color. Frito-Lay has used at least 20 wild species. Wild

species used for health and wellness studies and Corinne for PVY resistance. Some European clones are also being used as source of PVY resistance. DNA markers for PVY resistance.

13. **APHIS/Quarantine report** -- Jorge Abad
    - The USDA/APHIS facility is located in Beltsville, MD with about 35 acres land, surrounded by trees isolated from commercial production
    - Abad and his lab with crop specialist and 2 tissue culture specialist are responsible for potato, sweet potato, cassava and kiwifruit
    - Can request for anyone that is a legal resident of the US
    - Most of the emphasis is given to the detection of viruses, viroids and bacteria
    - It cost APHIS about $4,000/accession to test, clean up via therapy, retest and ensure that it is free of any pest and pathogen before it is being released.
    - Received all of the materials in tissue culture as plantlets,75 accession/year, if there is any suspicion or if the results are positive , they go through therapy followed by PCR, Elisa, Rt-PCR and biological test such as grafting onto sensitive indicators
    - Test to see if the virus is DNA or RNA virus.
    - If the material is positive with quarantine diseases, it will be destroyed.
    - If the virus is seed transmitted , more dangerous, we inoculate the healthy plants to identify the symptoms, such as leaf necrosis, tip malformation distortion
    - A new strain of PVS, symptomless , could not be detected on indicator plants but just under PCR. PVS -Andean is completely different strain or isolate.
    - There were 72 potato clones in the PGQR in the 2010-2011, 65 of them were released, 5 of them tested positive, they are currently in therapy, 2 of them did not grow.

14. **Resolutions**:

WHEREAS, Mrs. Adele Douglass has served as the lead person for technical support of evaluation publications from the US Potato Genebank for 18 years; therefore be it
RESOLVED, that the NRSP-6 Technical Advisory Committee congratulates Mrs. Douglass for her productivity, enthusiasm, and dedication to potato germplasm research, and awards her the "Potato Genebank Special Recognition Award" for 2010 under the sponsorship of Controlled Environment Technology Systems (CETS). The plaque reads, "Gratefully acknowledging potato genebank technical work of outstanding value to the potato industry"

WHEREAS, the NRSP-6 Technical Advisory Committee met at the Potato Genebank in Sturgeon Bay, Wisconsin on June 28, 2011; and
WHEREAS, those participating were involved in productive and stimulating discussions; therefore be it
RESOLVED, that the NRSP-6 Technical Advisory Committee expresses its appreciation to Dr. John Bamberg and his staff for coordinating the meeting, and be it further
RESOLVED, that an original of this resolution be provided to Dr. John Bamberg and that a copy be filed as a part of the official minutes of this meeting.

15. Elect new officers and set next meeting location

Officers

Chair:	Creighton Miller
Vice-Chair:	Fahrettin Goktepe or the replacement
Secretary:	David Douches

Next Meeting Venue = Texas, exact venue to be determined

Respectfully Submitted,

Fahrettin Goktepe

Tour of the USPG facilities was held on the morning of June 29th

NRSP-6 Technical Committee Meeting Agenda

Sturgeon Bay, WI / June 28, 2011
Draft 05-09-11

June 27th: Arrivals, Best Western Maritime Inn (see second page for places to stay)

June 28th: Breakfast OYO, snack break and lunch at genebank, group dinner about 6:00 pm at "The Log Den" (see second page)

There will be a $20.00 registration fee to cover lunch and breaks, there will be receipts for payment Tuesday morning.

8:30 AM: BUSINESS MEETING at genebank, 4312 Hwy 42

Preliminaries

1. Welcome, introductions, misc. announcements, distribution of documents
2. Approve, add to, schedule and prioritize agenda items
3. Review of 2010 minutes
4. Chair DeJong 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 report and FY12 outlook
11 Collecting and taxonomy (Spooner)
12. USDA, ARS admin (Bretting, Wisler)
13. NIFA (Thro)
14. APHIS/Quarantine (Abad)
15. *Review and approve resolutions
16 *Elect new officers and set next meeting venue

Wrap up at 4:30 pm to give time to change and meet for dinner at The Log Den.

June 29th, Breakfast OYO, snack break at genebank

9 AM: GENEBANK TOUR
PM: DEPARTURES

Hotel reservations.

A block of rooms is set aside for the NRSP-6 Meeting, June 27th and 28th .
Rate is a Government rate at $55.00 + tax

Best Western Maritime Inn.
1001 N 14th Ave
Sturgeon Bay WI 54235
920-743-7231

Another option for staying is:
Stone Harbor Resort
107 N 1st Ave
Sturgeon Bay WI 54235
920-746-0700

Ask for the Government rate, it is $74.00 + tax. We don't have rooms set a side at Stone Harbor. If you are bringing family this is definitely a nicer place and is close to the water and down town and shopping.

Tuesday night about 6:00 pm we will be eating dinner at:
The Log Den
6626 Hwy 42
Egg Harbor WI 54209
920-868-3888

It is located about 15 minutes north on Hwy 42 from the Best Western.

For other meeting information including driving directions,
SEE THE GENEBANK WEBSITE: http://www.ars-grin.gov/nr6

ANNUAL REPORT

Calendar Year 2010 updated to TAC 2011 meeting
see website for version with pictures

1. NRSP-6: UNITED STATES POTATO GENEBANK

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

2. COOPERATIVE AGENCIES AND PRINCIPAL LEADERS

State Agricultural Experimental Stations — Representative

Technical Representatives

Southern Region	Vice-Chair (2011)	J. C. Miller, Jr.
Western Region	Secretary (2011)	F. Goktepe
North Central Region		D. Douches
Northeastern Region	Chairman (2011)	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

Agricultural Research Service

Technical Representative	C. Brown
National Program Staff	P. Bretting
	G. Wisler
Midwest Area	L. Chandler & P. Simon

National Institute of Food and Agriculture (NIFA) — A. M. Thro

Animal and Plant Health Inspection Service — J. Abad

NRSP-6 Project Leader — J. Bamberg

Agriculture Canada

B. Bizimungu

3. PROGRESS AND PRINCIPAL ACCOMPLISHMENTS

A. Acquisitions and associated work

Bamberg and del Rio collected in the Santa Rita Mountains in SE Arizona in late September (supported with extramural funding from USDA), sampling 22 new S. *fendleri* sites (report available on request). This expedition was prompted by an observation by Correll that the Arizona sky islands have the most diverse potato germplasm. Dr. Bamberg and del Rio also recollected true seed from 3 of the 2009 Santa Catalina sites which had been collected as only 10 plants each.

Four new acquisitions were from Peru having drought tolerance and high phenolics, two clones from Poland with frost tolerance, two of Dr. Helgeson's somatic fusions with late blight resistance, and 25 Arizona collections by Dr. Bamberg and Dr. del Rio.

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 2010 informing them of new stocks of true seed, tubers, in vitro plantlets, or herbarium samples.

B. Preservation and Evaluation

We increased 235 wild seed populations, performed 600 PSTVd tests, 1450 germination tests, 106 ploidy determinations, and 30 tetrazolium seed viability tests. Cultivated species can be difficult to seed increase under screen or glass, so a backlog had developed. Over nine seasons we have removed most of that backlog by growing over 865 accessions (mostly *andigena*) in the field for OP seeds. This compromises the distinctiveness of the original material, but that seed was already produced mostly on samples of uncertain identity and genetic composition and, unlike wild species, having no natural site of origin.

The *in vitro* collection of cultivars was tested for viruses by A. Charkowski, Madison.

Cooperation with other genebanks

Test cold tolerant hybrids and calcium fertilization response with CIP in Peru. Some selections reported as having very promising frost resistance and yield in Puno and Cuzco. Some germplasm responds to calcium fertilization with 60% yield increase.

Did follow-up to easy versus remote collection sites study. Produced AFLP data with help of visiting scientist.

Requested all *microdontum* stocks from other world genebanks.

Recovered *topiary* mutant to the genebank from E. Leue, PanAm Seeds.

Evaluation for useful traits

General: Continue selecting 2x *tuberosum* family with improved tubers and male fertility. Discovered new highly female-crossable, high-flowering and good field-tuberizing 2x

tuberosum clone. Made F1 hybrids with all *microdontum, boliviense* and representatives of 30 other species.

K: Prepare samples for testing 200 field-grown varieties. Prepared samples of an additional 200 clones from the collection. Tested 500 individuals of the pop identified as having extremely high proteinase inhibitor, produced field tubers of 70 Colombian *phureja* populations (rich in colors and antiox), and field tested reputed long-day adaptation of 70 phu/stn populations (donated by F. Haynes).

Anti-cancer: Changed course from *microdontum* to instead confirm high tomatine *okadae* with R. Navarre and made hybrids with *tuberosum*.

Ca: Pursue mapping and enhancement with NRI grant collaborators. Found *microdontum* populations with even higher tuber calcium than previous elites.

pH: Select and test hybrids for screening in improved 2x *tuberosum* background.

GA: Genotype 2x and 4x revertants of dwarf-to-normal. Also testcrossed three Texas Norkota sports (coop with C. Miller). Discovered 2x forms of GA dwarfs have surprisingly high levels reversion to normal phenotype. These may have application in transformation. Production of custom forms, selections and hybrids resulted in: Discovery of a super-high antioxidant clone (with R. Navarre); high anti-cancer tomatine in breeding-friendly *S. microdontum,* anti-prostate-cancer proliferation factors in *S. jamesii* (C. Miller); anti-appetite proteinase inhibitor at six times the level of the previous standard extraction stocks; and novel materials resistant to black dot (C. Brown), late blight (H. Lozoya), *chitwoodi* nematode (C. Brown), high thiamine and folate clones (A. Goyer). All genebank *S. microdontum* families were cooperatively screened (B. Narasimhamoorthy) resulting in identification of extremely high protein stocks in this breeding-friendly species. We facilitated selection of clones suitable for organic production (A. Charkowski). We are producing replicate powder samples of over 400 field-grown clones for starch composition screening (S. Jansky). We secured an agreement with two Peruvian Universities to invest in testing our super-high antioxidant clone as means to mitigate cognitive effects of lead poisoning in children in Peruvian mining cities—and produced about 80 pounds of tubers for rat food. Produced and screened 93 populations of *microdontum* tubers for tuber late blight (D. Douches). Screened all of these and found some with consistent resistance to greening under fluorescent light and replanted for 2nd tuber generation to confirm.

Evaluation of genetic diversity with in species and populations (continue or start)

Assess drift due to low germination in model population PI 473166. Complete *a priori* visual clustering of LON species accessions. Planned comparison of diversity from collections from Rincon, Chiricahua, Santa Catalina, Santa Rita, Huachuca, Guadalupe and Pinaleno sky islands we have now collected in the southwest USA. Planned study of potential of drift due to selection of first-germinating seedlings. Investigated use of cell DNA content screening of seeds to detect apomicts.

C. Classification

This year David Spooner did research on: 1) phylogeny of wild potato ingroups and outgroups, 2) chromosome evolution of potato, 3) evolution of cultivated potato, 4) geographic information system (GIS) analyses of distribution of escaped populations of wild potato and of ploidy of cultivated potato, and 5) characterization of genebank acceccions of potato.

D. Distribution

The volume and types of stocks sent to various consignee categories are summarized in the table below. NRSP-6 distributed 201 orders to clients in 31 states of the USA and 20 orders to 12 other countries.

	Units of Germplasm Sent[1]								
Category	Seed	TU	TC	IV	DNA	Plants	Herb	Total	PIs
Domestic	2,639	10	1,835	2,070	117	0	0	6,671	4,345
Foreign	655	0	0	911	3	0	0	1,569	740
Total	3,294	10	1,835	2,981	120	0	0	8,240	5,085

[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

Bamberg and del Rio presented papers at the 2010 Potato Assn of America meeting. Bamberg got invitation (paid) to be keynote speaker at Latin American Potato Assn (ALAP) meeting at Cusco, Peru. Invitation to present southwest USA germplasm collecting and research program at ASHS. Invitation (paid) to present general genebank talk at US Botanic Gardens Potato Expo on the capitol mall in DC. Invited to present genebank's service to potato industry at NPC planning session in Orlando. An agenda brief on NRSP-6 progress was sent to all regional association spring meetings.

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

4. SPECIFIC IMPACT STATEMENT for 2010 -- Health

Annual healthcare cost of obesity is about $147B. In 2009 we started working with Kemin Company to improve the yield of PI2, a safe and effective appetite suppressant from potato. To date, we have identified exotics with roughly 6-fold concentration as the standard cultivar previously used! We are also working with S. Jansky to screen for lower-glyceamic starch composition. This could help prevent and manage diabetes, which incurs extra annual healthcare costs of about $10-12K per person per year in the US. Cancer costs the nation about $90B. With cooperators R. Navarre and C. Miller we made progress in identifying anti-cancer potato germplasm (*jamesii* antiproliferation and high tomatine *okadae*) for use in breeding, and have hybridized the latter with our new "universal crosser". Stroke is the 3rd leading cause of death in the USA, the leading cause of disability, and costs $43B. Hypertension promoted by sodium is a prominent risk factor. Estimates indicate that a high potassium diet would reduce hypertension and avert 100,000 deaths each year. In 2009-2010 we prepared test samples and are arranging tests for potassium. With R. Navarre, we also identified a *phureja* clone with extremely high antioxidants, well-known for their health-promoting effects. Lead poisoning is a worldwide threat, with mental development of children being particularly at risk. The high antiox clone has been exported to Peru and testing is being arranged to test the ability of high antiox potato to attenuate lead toxicity effects on cognitive skill in young rats. The total cost of these diseases each year is more than 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 must have much greater potential than using germplasm to increase yield or reduce production costs. Of course, improving nutritional reputation of potato will also increase crop demand in an increasingly health-conscious society.

5. WORK PLANS / STAFF & FUNDING / ADMINISTRATION

Fast and accurate delivery of high quality germplasm and information will continue to be the general objective of NRSP-6. We also aim to raise awareness of the germplasm resource through an advertising/outreach program, and by conducting and publishing research that demonstrates new ways the germplasm can be useful for potato improvement.

Tim Kazmierzak was hired as a new USDA/ARS "Gardener" to replace retiring Charles "Chico" Fernandez.

Restrictions on acquisitions and limited funds for preservation mean we need optimal efficiency in keeping the diversity we already have. Thus, finding the best techniques for assaying the status and dynamics of genetic diversity in the genebank (using DNA markers) remains a high priority. We try to make use of all USA collection expedition stocks as subjects for genetic diversity research that will help the genebank know how to maximize preservation of diversity.

6. PUBLICATIONS ISSUED DURING THE YEAR 2010

A. Publications issued by NRSP-6 Personnel

Ames, M. and D.M. Spooner. 2010. Phylogeny of *Solanum* series *Piurana* and related species in *Solanum* section *Petota* based on five conserved ortholog sequences. Taxon 59:1091-1104 + 4-pg foldout Fig.1 (tree.).

Bamberg, John B. 2010. Tuber dormancy lasting eight years in the wild potato *Solanum jamesii*. Am J Pot Res 87:226-228.

Bamberg, J.B. and A. del Rio. 2010. Selfing potato species produce robust spontaneous seed increase under floating mesh. Am J Pot Res 87:113. (Abstract)

Bamberg, J.B. and A. del Rio. 2010. Diversity relationships in tetraploid wild potato native to the USA. Am J Pot Res 88:29-30. (Abstract)

Bamberg, John B. and Alecia M. Kiszonas. 2010. Survey of tuber pH variation in potato (*Solanum*) species. Am J Pot Res 87:167-176.

Bamberg, John, A. del Rio, C. Fernandez, A. Salas, S. Vega, C. Zorrilla, W. Roca, and D. Tay. 2010. Comparison of "Remote" versus "Easy" *In Situ* collection locations for USA wild *Solanum* (potato) germplasm. Am J Pot Res 87:277-284.

Cai, X, D. Spooner, D. Halterman, A. Charkowski, R. Groves, and S. Jansky. 2010. A test of taxonomic and biogeographic predictivity: resistance to potato virus Y in wild relatives of the cultivated potato. Am J Pot Res 88:32. (Abstract)

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Del Rio, A., J. Bamberg, R. Centeno-Diaz, J. Soto, A. Salas, W. Roca, and D. Tay. 2010. Microsatellite (SSR) marker analysis to examine the effects of pesticide contamination on the genetic diversity of potato species. Am J Pot Res 88:35-36. (Abstract)

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Lozoya-Saldana, Hector, Aida Juarez Cruz, M. Teresa Colinas Leon, and John Bamberg. 2010. Enzymatic activation against (*Phytophthora infestans* Mont., de Bary) in *Solanum* species. Am J Pot Res 88:53. (Abstract)

Mione, T. and D.M. Spooner. 2010. *Jaltomata bohsiana*, A new species and key to the *Jaltomata* (Solanaceae) of Mexico. Novon 20:186-189.

Nitzan, Nadav, R.A. Quick, W.D. Hutson, J.B. Bamberg, and C.R. Brown. 2010. Partial resistance to potato black dot, caused by *Colletotrichum coccodes* in *Solanum tuberosum* group *andigena*. Am J Pot Res 87:502-508.

Rodriguez, F., M. Ghislain, A.M. Clausen, S.H. Jansky, and D.M. Spooner. 2010. Hybrid origins of cultivated potatoes. Theor Appl Genet 121:1187-1198.

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Spooner, D.M. 2010. Botany of the potato, 2. Morphology and anatomy, 3. Plant introduction and maintenance. pp. 4-7 In: W.H. Bohl and S.B. Johnson (eds.). Commercial potato production in North America, ed. 2. The Potato Association of America Handbook, Supplement Vol. 57 of USDA Handbook 267. The Potato Association of America, Orono, ME. http://potatoassociation.org/documents/A_ProductionHandbook_Final.pdf

Spooner, D.M. 2010. COSII-based mapping and diversity in potato, tomato, sweet potato, and carrot. 2010 Plant and Animal Genome Meeting. (Abstract)

Spooner, D.M. 2010. Development of asymmetric single-strand sequence polymorphism (SSCP) to separate COSII alleles in potato, tomato, sweet potato, and carrot. 2010 Plant and Animal Genome Meeting. (Abstract)

Spooner, D.M. 2010. Unraveling the evolutionary history of wild potatoes and tomatoes. Botany 2010 Annual Meeting Abstracts. (Abstract)

Spooner, D.M. 2010. Complex multiple reticulate origins of potato polyploids. Botany 2010 Annual Meeting Abstracts. (Abstract)

Spooner, D.M. 2010. Taxonomy of cultivated potatoes (*Solanum* section *Petota*: *Solanaceae*). Botany 2010 Annual Meeting Abstracts. (Abstract)

Spooner, D.M. 2010. Multiple nuclear ortholog (COSII) phylogeny of wild Potatoes and tomatoes. Crop Science Society of America Annual meeting Abstracts. (Abstract)

Spooner, D.M., T. Gavrilenko, S.H. Jansky, A. Ovchinnikova, E. Krylova, S. Knapp, and R. Simon. 2010. Ecogeography of ploidy variation in cultivated potato (*Solanum* sect. *Petota*). Am J Bot 97:2049-2060.

B. Journal Articles and Abstracts Reporting Research with NRSP-6 Stocks

Agrawal, Lalit and Roy Navarre. 2010. Exploring opportunities to increase potatoes protein content and disease resistance using molecular methods or germplasm mining. Am J Pot Res 88:29. (Abstract)

Alyokhin, Andrei and Raymond Choban. 2010. Maturity-dependent mortality of Colorado potato beetle eggs treated with novaluron. Am J Pot Res 87:557-560.

Bhaskar, P.B., L. Wu, J.S. Busse, B.R. Whitty, A.J. Hamernik, S.H. Jansky, C.R. Buell, P.C. Bethke, and J. Jiang. 2010. Suppression of the vacuolar invertase gene prevents cold-induced sweetening in potato. Plant Physio 154:939-948.

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Boluarte-Medina, T., N. Manrique-Carpintero, S.M. Piovano, A. Pereira, and R.E. Veilleux. 2010. Activation tagging in potato: developing a population of mutants to facilitate genetic studies. Am J Pot Res 88:31. (Abstract)

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Brown, C.R., H. Mojtahedi, L.-H. Zhang, and E. Riga. 2009. Independent resistant reactions expressed in root and tuber of potato breeding lines with introgressed resistance to *Meloidogyne chitwoodi*. Phyto 99(9):1085-1089.

Cho, J., Y. Park, J. Kim, H. Cho, K. Cho, and D. Chang. 2010. Selection of new potato germplasm with common scab resistance from wild species of potato in Korea. Am J Pot Res 88:33. (Abstract)

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Douches, D.S., F.M. Navarro, C.A. Thill, and A.L. Thompson. 2010. North Central Regional potato cultivar development. Am J Pot Res 88:36. (Abstract)

Farnsworth, B.L., N.C. Gudmestad, J.A. Pasche, G.A. Secor, N. David, R. Nilles, H. Hatterman-Valenti, M. Glynn, J.R. Sowokinos, C. Rosen, D. Preston, and A.L. Thompson. 2010. Am J Pot Res 88:37-38. (Abstract)

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Halterman, Dennis, Shelley Jansky and Austin Meier. 2010. Verticillium wilt in potato: Host-pathogen interactions and breeding for resistance. Am J Pot Res 88:42-43. (Abstract)

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Mayton, H., H. Griffiths, I. Simko, S. Cheng, J. Lorenzen, W. De Jong, and W.E. Fry. 2010. Foliar and tuber late blight resistance in a *Solanum tuberosum* breeding population. Pl Breed 129:197-201.

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Nitzan, Nadav, K.G. Haynes, J.S. Miller, D.A. Johnson, T.F. Cummings, D.L. Batchelor, C. Olsen, and C.R. Brown. 2010. Genetic stability in potato germplasm for resistance to root galling caused by the pathogen *Spongospora subterranean*. Am J Pot Res 87:497-501.

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C. Theses Reporting Research with NRSP-6 Stocks

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Pompon, J. 2010. Performance influenced by host-plant selection and feeding behavior in potato colonizing aphids. PhD Thesis, University of New Brunswick, Fredericton, New Brunswick, Canada.

Vunnam, Rakesh. 2010. Antioxidant capacity and polyphenolic content of potato tubers are affected by cultivar and hermetic treatment. MS Thesis, McGill University, Plant Science Dept., Ste Anne de Bellevue, QC, Canada.

2010 NRSP-6 Germplasm Utilization Report from the North Central Region

Compiled and Submitted by
David S. Douches, NC representative

Michigan State University
David Douches

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 4x chromosomes) and exploit more efficient selection of desirable traits. This 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).

In the past we made crosses with late blight resistant diploid lines derived from various *Solanum microdontum* accessions. This *S. microdontum*-based resistance is unique and very effective against the US-8 strains. These progeny are being grown in the greenhouse and now we have used DNA marker analysis to identify which lines have the late blight resistance. We have also a cloned candidate late blight resistance R-gene that has been transformed into susceptible potatoes to test its efficacy. These plants are currently planted in our late blight trials for 2011.

In 2010 we developed genetic mapping populations (both at diploid and tetraploid levels) for late blight resistance, scab resistance and also for tuber quality traits. We will start to characterize these populations in 2011 and conduct the linkage analysis studies following the SNP genotyping. The diploid genetic material represent material from South American potato species and other countries around the world that are potential sources of resistance to Colorado potato beetle, late blight, potato early die, and ability to cold-chip process. We have used lines with Verticillium wilt resistance, PVY resistance, and cold chip-processing that has Solanum species introgression. We are monitoring the introgression of this germplasm through marker assisted selection. In 2010 we obtained tubers of some varieties from Mexico, South America and India to screen for late blight and potato tuber moth resistance. We made selections and have made crosses to introgress this germplasm into our breeding pool. Through state funding (GREEEN), we were able to continue a breeding effort to introgress leptine-based insect resistance using new material selected from USDA/ARS material developed in Wisconsin. We will continue conducting extensive field screening for resistance to Colorado potato beetle at the Montcalm Research Farm and in cages at the Michigan State University Horticulture Farm.

One of our approaches to breeding for foliar resistance to late blight is to use interploidy (4x-2x) crosses to introgress the late blight resistance from *Solanum microdontum*. 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. berthaualtii* and *S. microdontum*. We are hoping that with a combination of conventional crossing and transgenic approaches we can create cultivars that can be commercialized by the North American potato industry that have a stronger or durable resistance to late blight. This past winter we

made more crosses with late blight resistant diploid lines derived from *Solanum microdontum*. Tuber families are being grown out for selection 2012.

In 2010 we conducted our Colorado potato beetle resistance screening 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 will be 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 will be collected at the MRF and placed into each of the cages on MSU campus. 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. The 15 best selections are being re-evaluated in 2011.

Through SolCAP we have SNP genotyped 10 species selections that were submitted by Dr. David Spooner. In our SNP validation test, the species did have the SNP calls and were shown to be distinct from the cultivated gene pool. Having SNP calls rather than null calls suggests that the SNPs are robust enough to examine species germplasm.

Through genetic engineering studies we are accessing the RB gene from *S. bulbocastanum* and the eIF4E gene from *Solanum habrocaites* (a tomato species) that confers late blight and PVY resistance, respectively.

Potato Breeding, Selection, and Cultivar Development
North Dakota

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The North Dakota Agricultural Experiment Station (at NDSU) has released 24 named cultivars. Additionally, it has participated in joint releases with state, federal and Canadian potato research programs. The potato breeding program has many collaborators and cooperators on the NDSU campus and at other institutions across North America. These associations improve the likelihood of developing successful cultivars. Unselecting seedling tuber populations are exchanged with programs in Texas, Idaho, Maine, Colorado, amongst others.

The breeding program objectives at NDSU are to:

1) Develop potato (*Solanum tuberosum* Group Tuberosum L.) cultivars for North Dakota, the Northern Plains, and beyond, using traditional hybridization and biotechnological techniques as appropriate, that are genetically superior for yield, market-limiting traits, and processing quality.

2) Identify and introgress into adapted potato germplasm, genetic resistance to major disease, insect, and nematode pests causing economic losses in potato production in North Dakota and the Northern Plains.

3) Identify and develop enhanced germplasm with resistance to environmental stresses and improved quality characteristics for adoption by consumers and industry personnel.

Major areas of research at NDSU

Market classes of potato include round reds for tablestock, round whites primarily for chipping, russets and long whites for processing and tablestock, and specialty cultivars which possess distinct skin and flesh colors. The NDSU potato breeding program is actively involved in breeding, selecting, and developing all. While the specialty market is an emerging area of importance and only a small segment of the ND industry, these cultivars are increasingly in demand by consumers, provide aesthetic and enhanced phytonutrient values, offer exceptional flavor, and unique culinary qualities.

Potato production is influenced by numerous abiotic and biotic stresses including moisture, temperature, and pests. Development of resistance to common pesticides, restricted use of pesticides, concern for our water and soil resources, and the expense of chemical inputs and long-term storage contribute to the need for developing cultivars with genetic resistance to insect pests including Colorado Potato Beetle (CPB), *Leptinotarsa decemlineata* (Say), and Green Peach Aphid (GPA), *Myzus persicae*(Sulzer); diseases including late blight caused by *Phytophthora infestans* (Mont) de Bary, pink rot caused by *Phytophthora erythroseptica* Pethyb., leak caused by *Pythium ultimum* Trow., Verticillium wilt (*Verticillium dahliae* Kleb.), and silver scurf caused by *Helminthosporium solani* Dur. & Mont. amongst others; and to environmental stresses including cold sweetening and the sugar end disorder. Host plant resistance is an important component of an integrated approach to pest management and may result in economically sustainable production due to reduced input costs and limited environmental impact. Traditional breeding techniques, including dedicated crossing blocks and developing early generation screening techniques, combined with biotechnological techniques such as the use of marker assisted selection, and the use of greenhouse and field screening nurseries, is used in the identification and selection of improved genotypes and development of resistant cultivars.

In order to maximize heterosis, enhance quality characteristics, and provide host plant resistance to important diseases and pests, genetic diversity of parents is warranted. Primitive and wild species derived material has been used in the NDSU breeding program since 1930. Currently, some primitive varieties and species-hybrids including some with *S. acaule*, *S. chacoense*, *S. demissum*, *S. etuberosum*, *S. phureja*, *S. tuberosum* gp. Andigenum, *S. fendleri*, *S. vernei*, and *S. polytrichon* contributing resistance to pests, pathogens and stress are being utilized in the NDSU potato breeding program. Additionally, many such as *S. chacoense*, *fendleri*, and *raphanifolium* bestow enhanced quality attributes such as high dry matter content and processing ability. We recently obtained the cultivar Burbank from the NRSP-6 program and have been using it in crossing with our processing russets. NDSU releases with diploid ancestry are NorValley (Novy et al. 1998), Dakota Pearl (Thompson et al. 2005), and Dakota Diamond (Thompson et al. 2008). All are cold-chipping cultivars with Gp. Phureja in their pedigree and Dakota Diamond also has *S. chacoense* in its pedigree.

While we have not recently accessed any species germplasm, that is a goal for 2011 to select some to conduct pre-breeding in order to develop genotypes suitable for resistance breeding efforts, perhaps focusing on Verticillium wilt, powdery scab, or mop top (all emerging pest issues in the northern plains).

NRSP-6 University of Wisconsin 2011 Report
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 2010 we initiated a project to understand the variability on frost tolerance by studying candidate genes that may be present in a number of species that have variable frost tolerance; the species presently screened are *S. sanctate-rosae, S. commersonii, S. demissum, S. megistracrobolum, S. cardiophyllum, S. polyadenium, S. bukasovii, S. acaule, S. chacoense and S. piurae*. We are studying polymorphism for 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. In addition, F2 and BC_1 populations are being generated from a cross made between the frost tolerant *S. commersomii* x *S. cardiophylum* (frost sensitive) accessions obtained from the NRSP-6. These populations will be used to identify and validate molecular markers associated with frost tolerance.

Using *S. microdontum* and *S. kurtzianum* species, we are developing segregating progenies for tuber calcium.and resistance to soft rot. 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*.

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.

In collaboration with CIP, we are studying of the impact of agrichemicals on *in situ* wild potato reproduction continued, and we initiated a related project to assess the impact of mining pollution and acid rain on wild potato reproduction. For this project we are using 25 species of the mini-core collection and *S. ambosinum, S. cajamarquense, S. chiquidenum, S. chomatophilum, S. dolichocremastrum, S. hypacrarthrum, S. limbaniense, S. medians, tarapatanum, S. urubambae*.

Jim Bradeen
University of Minnesota
Department of Plant Pathology

Our research focuses on potato pathology and genomics with particular emphases on issues of genome evolution and disease resistance gene content in wild relatives of potato. During the past year, we have utilized NRSP-6 germplasm to study **genome evolution** among potato tertiary genepool species. DArT marker-based linkage maps have been constructed for *Solanum bulbocastanum* and *S. commersonii*. Using sequences determined from mapped DArT markers, we have completed *in silico* comparisons of genome structure between these species and cultivated potato and tomato (for which whole genome sequence is available to the research community). We are now testing a novel high throughput sequencing-based method for linkage map development in *S. commersonii*. Additionally, we have generated mapping populations for *S. pinnatisectum, S. tarnii,* and *S. trifidum*, all using NRSP-6 germplasm. These populations will be used in future genome mapping experiments. Toward comprehensive elucidation of **disease resistance gene content** in *Solanum* species, we have generated the largest candidate resistance gene data set for any *Solanum* species using an NRSP-6 accession of *S. bulbocastanum.* Sequences of disease resistance genes discovered in the genome of this species were integrated into a Solanaceae-wide framework of disease resistance genes, revealing evolutionary patterns that predict relative functional significance for certain gene lineages. On-going efforts to determine disease resistance gene content will make extensive use of NRSP-6 germplasm and are aimed at identifying novel disease resistance alleles for potato crop improvement.

Jiming Jiang
University of Wisconsin

My lab has been using different Solanum species (representing different genomes, A, B, P, E) for comparative mapping of BACs and repetitive DNA sequences. We will continue this effort in the next few years. I am sending you two pdf files, one paper published in Chromosoma last year and another in press by G3.

Ellen Leue
Director of New Crops
PanAmerican Seed Company – Research
1S861 Green Road
Elburn, IL USA 60119

I'd like to report that I appreciate the support of our small potato breeding project for home gardens. The PI station in Sturgeon Bay shared 2x S. tuberosum material for crossing to ornamental wild potatoes, and it was used successfully. Although it will be many years before this product is ready for market, the inputs from the PI station were essential to be able to make progress. Again, much appreciated.

David C. Zlesak
Assistant Professor of Horticulture
UWRF Plant and Earth Science Department
410 S. 3rd Street
River Falls, WI 54022

Great to hear from you! I hope you are doing well. I was a MS student of Dr. Christian Thill from 98-2001. I'm teaching at UW-River Falls now and this past spring in the Plant Tissue Culture class I teach we used germplasm from NRSP-6 to demonstrate tuberization under dark versus light and with and without media containing higher sugar/Kinetin. Additionally, a student for her special project chose the potatoes to compare and contrast different vitamin additions to MS media (standard MS, coconut milk, V8 juice, control) on overall growth.

I'm very thankful for NRSP-6 and all of the great work that Dr. Bamberg and Max and others do to preserve precious germplasm.

2010 NC ORDERS

Brookover, Charles
chasbrookover@hotmail.com
PHONE: (740) 536-7019
FAX: ****
2840 Logan-Thornville Road
Rushville, Ohio 43150
1 units shipped in 1 order/s

Cai, Xingkui
xcai5@wisc.edu
PHONE: (608) 890-0242
FAX: 608-262-4743
University of Wisconsin
Department of Horticulture
Madison, Wisconsin 53706
44 units shipped in 1 order/s

Carole, Maronek
maronek@aol.com
PHONE: (920) 854-2106
FAX: ****
5 units shipped in 1 order/s

1519 Door Bluff Road
Ellison Bay, Wisconsin 54210

Charkowski, Dr. Amy
amyc@plantpath.wisc.edu
PHONE: (608) 262-7911
FAX: 608-263-2626
302 units shipped in 2 order/s

University of Wisconsin
Department of Plant Pathology
Madison, Wisconsin 53706-1598

Chung, Yong Suk
saga137@gmail.com
PHONE: (608) 262-8324
FAX: 608-262-4743
172 units shipped in 2 order/s

University of Wisconsin
Department of Horticulture
Madison, Wisconsin 53706

Compton, Michael E.
compton@uwplatt.edu
PHONE: (608) 342-1323
FAX: (608) 342-1395
3 units shipped in 1 order/s

University of Wisconsin - Platteville
School of Ag - 1 University Plazza
Platteville, Wisconsin 53818

Cook, Alexandria
heather@heathercook.net
PHONE: (816) 200-0682
FAX: ****
3 units shipped in 1 order/s

1120 Edmond
St. Joseph, Missouri 64501

Cook, Marcia
marcia115@tryafrog.net
PHONE: (816) 858-5866
FAX: ****
2 units shipped in 1 order/s

412 2nd Street
Platte City, Missouri 64079

Coombs, Joseph
coombs@msu.edu
PHONE: (517) 353-3145
FAX: 517-353-5174
49 units shipped in 4 order/s

Michigan State University
Crop & Soil Science Department
East Lancing, Michigan 48824

Del Rio, Dr. Alfonso
adelrioc@wisc.edu
PHONE: (608) 262-5350
FAX: (608) 262-4743
194 units shipped in 4 order/s

University of Wisconsin
Department of Horticulture
Madison, Wisconsin 53706

Douches, Dr. David S.
douchesd@msu.edu
PHONE: (517) 355-0271
FAX: 517-353-5174
4 units shipped in 1 order/s

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

Fajardo, Diego Alberto
fajardo@wisc.edu
PHONE: (608) 264-5213
FAX: 608-262-4743
365 units shipped in 5 order/s

University of Wisconsin
Department of Horticulture
Madison, Wisconsin 53706

Garnighian, Grania
graniagarnighian@yahoo.com
PHONE: (952) 388-9818
FAX: ****
9 units shipped in 1 order/s

Primordia Seeds
10450 185th Street
Lakeville, Minnesota 55372

Genger, Ruth
rkgenger@wisc.edu
PHONE: (608) 265-3056
FAX: ****
165 units shipped in 1 order/s

University of Wisconsin
Department of Plant Pathology
Madison, Wisconsin 53706

Greaves, Dr. John A.
john.greaves@kemin.com
PHONE: (515) 559-5100
FAX: (515) 559-5232
1796 units shipped in 12 order/s

Kemin Industries, INC
2100 Maury St.
Des Moines, Iowa 50306-0070

Haak, David
dhaak@indiana.edu
PHONE: (206) 913-8472
FAX: ****
24 units shipped in 1 order/s

Indiana University
325 Jordan Hall
Bloomington, Indiana 47405

Haga, Emily Rose
ehaack@wisc.edu
PHONE: (608) 262-8324
FAX: 608-262-4743
245 units shipped in 3 order/s

University of Wisconsin
1575 Linden Drive
Madison, Wisconsin 53706

Hannapel, Dr. David
djh@iastate.edu
PHONE: (515) 294-9130
FAX: 515-294-0730
3 units shipped in 1 order/s

Iowa State University
Department of Horticulture
Ames, Iowa 50011-1100

Hoopes, Dr. Robert W.
robert.hoopes@fritolay.com
PHONE: (715) 362-7419
FAX: 715-369-0797
3 units shipped in 1 order/s

Frito-Lay, Inc
4295 Tenderfoot Road
Rhinelander, Wisconsin 54501

Jiang, Dr. Jiming
jjiang1@wisc.edu
PHONE: (608) 262-1878
FAX: 608-262-4743
8 units shipped in 1 order/s

University of Wisconsin
Department of Horticulture
Madison, Wisconsin 53706

Kear, Philip
philip.kear@gmail.com
PHONE: (573) 882-3939
FAX: (573) 884-9395
11 units shipped in 2 order/s

University of Missouri
246 Christopher S. Bond Life Sci Center
Columbia, Missouri 65211

Leue, Ellen
eleue@ballhort.com
PHONE: (630) 365-5700
FAX: ****
10 units shipped in 1 order/s

PanAmerican Plant Research
1S861 Green Road
Elburn, Illinois 60119

Palta, Dr. Jiwan
jppalta@wisc.edu
PHONE: ****
FAX: ****
38 units shipped in 4 order/s

University of Wisconsin
Department of Horticulture
Madison, Wisconsin 53706

Petrick, Janina
j_petrick@gbms.us
PHONE: (262) 246-1799
FAX: (262) 246-1762
60 units shipped in 1 order/s

CETS Technology
N77W24677 Century Ct.
Sussex, Wisconsin 53089

Ronis, Daniel H.
daniel.ronis@fritolay.com
PHONE: (715) 365-1618
FAX: 715-365-1620
48 units shipped in 3 order/s

Frito-Lay
Agriculture Research and Developement
Rhinelander, Wisconsin 54235

Rouse, Doug
dir@plantpath.wisc.edu
PHONE: (608) 262-1395
FAX: ****
1 units shipped in 1 order/s

University of Wisconsin
Department of Plant Pathology
Madison, Wisconsin 53706

Schauvinhold, Ines
inesscha@umich.edu
PHONE: (734) 763-3997
FAX: ****
9 units shipped in 1 order/s

University of Michigan
MCDB - Nat. Sci. Bld. - Room 4097
Ann Arbor, Michigan 48105

Simrell, Merle
mojays8@yahoo.com
PHONE: (417) 465-2342
FAX: ****
12 units shipped in 1 order/s

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

Thill, Dr. Christian
thill005@tc.umn.edu
PHONE: (612) 624-9737
FAX: 612-624-4941
5 units shipped in 1 order/s

University of Minnesota
Department of Horticultural Sciences
St. Paul, Minnesota 55108

Thomas-Britt, Kimberly
kimberly@uwm.edu
PHONE: (414) 763-5546
FAX: ****
2 units shipped in 1 order/s

Century City Neighborhood Assc
3859 N 23rd Street
Milwaukee, Wisconsin 53206

Turcotte, Amy
amy.j.turcotte@fritolay.com
PHONE: (715) 365-1611
FAX: 715-365-1620
5 units shipped in 1 order/s

Frito-Lay
Agriculture Research and Developement
Rhinelander, Wisconsin 54235

William, Lane
j986487@yahoo.com
PHONE: (513) 867-0156
FAX: ****
1 units shipped in 1 order/s

5763 greencrest dr.
Hamilton, Ohio 45011

Witherell, Andy
raw@plantpath.wisc.edu
PHONE: (608) 263-8765
FAX: 608-262-7871
1 units shipped in 1 order/s

Wisconsin Seed Certification Lab
Room 237 Biotron Lab
Madison, Wisconsin 53706

Zlesak, David
david.zlesak@uwrf.edu
PHONE: (763) 486-7920
FAX: ****
34 units shipped in 1 order/s

University of Wisconsin - River Falls
Plant and Earch Science Department
River Falls, Wisconsin 54022

**** = INFORMATION NOT PROVIDED BY COOPERATOR

Report to NRSP-6 Technical Committee, July 2011

Northeast Region Representative: Walter De Jong

The Northeast region received 647 units of germplasm, spread across 14 requests, in 2010.

Comments received from recipients follow:

Ai Kitazumi (grad student in de los Reyes lab, University of Maine – Orono).
Requested ten units – looking at evolution of cis-acting regulatory sequences.

A major focus of our lab is on comparative analysis of regulatory information content of stress related genes (both protein coding genes and non-protein coding regulatory RNA) across species and genera in order to infer evolutionary events leading to functional divergence within the context of spatio-temporal regulation. Current emphases of this study are on: 1) Intergeneric comparison of cis-regulatory information content across orthologous groups of stress related genes from species representing various levels of synteny or lack of synteny (Oryza sativa, Sorghum bicolor, Brachypodium distachyon, Arabidopsis thaliana); 2) Assessing changes in cis-regulatory information content within genus as a result of selection and domestication (e.g. between diploid Oryza species). We have recently expanded the scope of this objective to include also the analysis of orthologous genes that we have studied in rice and Arabidopsis to cultivated and wild species of potatoes. To this end, the Potato Germplasm Center provided us with: 1) Accurate information about the possible site of origin of certain germplasm entries/accessions in order to ensure that our experimental samples represent a wide spectrum of variation; 2) Guaranteed pure lines/stocks tested from years of excellent maintenance at the germplasm center; and 3) Helpful assistance to obtain rare cultivars/germplasm entries such as Sullu. The initial aim of the experiments on potatoes is to identify stress-induced microRNA exhibiting differential expression between andigenum and tuberosum.

David Lambert, University of Maine
Requested Saturna to test its reaction to powdery scab and potato mop top virus. In Europe, Saturna is reported to be highly susceptible to both. Thus hoping it can serve as an "indicator" plant here.

Jianfei Xu, Chinese Academy of Agricultural Science (visiting scientist at Cornell when request placed)
Requested 266 units, mostly to evaluate for resistance to late blight. Is also evaluating agronomic performance of several clones.

Keith Perry, Cornell University
Requested 22 units. Ongoing goal for past six years has been to identify accessions with useful attributes for production in the northeast.

Over the past six years, we have probably screened ~150 accessions from Sturgeon Bay. Of these, two have been introduced for foundation seed production, Papa Cacho and Aeggeblomme; curiously, the latter is no longer kept in the USDA repository.

Steve Crouse, Katahdin Gardens, Patten Maine
Requested seven varieties.

I received good quality plantlets in a timely manner and was very satisfied overall. I was impressed that I, as a small producer, received excellent service.

Stuart Campbell, PhD student (Andre Kessler lab), Cornell University
Requested four units.

The genebank definitely met my needs last year. I am a finishing PhD student conducting a large study on the evolution of defences in the Solanaceae, including Petunia, Nicotiana, Lycium, Datura, Capsicum, Cestrum, Brugmansia and Solanum taxa. Within the genus Solanum, I am examining numerous wild species of potato, and the Potato Genebank has proven to be an invaluable resource for these taxa. When I have had questions, the research staff at the genebank have always been extremely helpful.

Steve Turaj, University of New Hampshire, Cooperative Extension
Requested seven units.

I'm in Coos County, NH (the northernmost top above the White Mtns). This used to be a fairly large potato growing region, now dairy and forage crops instead. Have a number of small-scale farms growing potatoes for direct sales, ie Farmers Markets and such.
I generally try to introduce them to different varieties that will grow well up here and have some direct market appeal. We also had a severe problem with Late Blight in 2009, so interested in disease resistance as well. The selections I receive […] are usually grown either in a trial bed nearby my office or given to an experienced grower for evaluation. I'd like to come up with two or three unique varieties that we might propagate and distribute to others in the county that they might maintain as a foundation seed.
Pretty small-scale effort at this point but could be a potential marketing niche. Personally, I find some of the research on the Korean "Valley" cultivars intriguing.

Katja Poveda, Research Associate (Jennifer Thaler lab), Cornell University
Requested four units.

I am using it to see if the overcompensatory response to herbivore (Tecia solanivora) damage thatI am finding in a Colombian potato variety (Poveda et al 2010
Ecological Applications 20(7): 1787-1793) is also present in other potato varieties that may be related with it. In order to find the traits that make overcompensation possible and this way to understand how potato production could be increased this material is crucial for our research. Also the new Colombian variety is now stored in the
genebank (after we requested it from Colombia) and this guarantees us that in case we need this variety again we could access it easily. I hope this can help somehow since for us the genebank is of huge value to keep our research going.

Southern Region Report to NRSP-6 Technical Committee

J. Creighton Miller, Jr.
June 28-29, 2011

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.

Seventeen entities in the Southern Region ordered a total of 129 accessions. This was down significantly from the 422 units ordered in 2009.

2010 SOUTHERN REGION ORDERS

Augutis, Kevin
augutis01@aol.com
PHONE: (561) 714-2076
FAX: ****
1 units shipped in 1 order/s

Augutis Property Management
1620 Fenton Drive
Delray Beach, Florida 33445

Bourgeois, Blane
iconoclast_psychoacoustics@yahoo.com
PHONE: (870) 895-3174
FAX: ****
22 units shipped in 1 order/s

The Rare Vegetable Seed Consortium
Ethnobotanical Research Institute
Salem, Arkansas 72576

Chen, Feng
fengc@utk.edu
PHONE: (865) 974-8521
FAX: ****
6 units shipped in 1 order/s

University of Tennessee
252 Ellington Plant Science Bldg.
Knoxville, Tennessee 37996-4561

DeMaris, Autumn
autumn.demaris@yahoo.com
PHONE: (817) 727-5603
FAX: ****
6 units shipped in 1 order/s

7940 Summit Cove
Fort Worth, Texas 76179

Duffano, Sayward
saywardstudio@yahoo.com
PHONE: (228) 229-5559
FAX: ****
10 units shipped in 1 order/s

833 Oakleigh Avenue
Gulfport, Mississippi 39507

Fitzgerald, Mitch
mitchandesther@live.com
PHONE: (405) 428-2321
FAX: ****
1 units shipped in 1 order/s

316 N Madison
Blanchard, Oklahoma 73010

Graham, David
grahamsfarm@yahoo.com
PHONE: (936) 222-3706
FAX: ****
1 units shipped in 1 order/s

Graham's Farm
1183 Country Road 1835
Crockett, Texas 75835

Hamrick, A C
motocat@windstream.net
PHONE: (859) 354-4338
FAX: ****
1 units shipped in 1 order/s

PO Box 912
Nicholasville, Kentucky 40340-0912

King, Brian
bcking2@uky.edu
PHONE: (859) 257-2409
FAX: ****
1 units shipped in 1 order/s

University of Kentucky
1401 University Drive
Lexington, Kentucky 40456-0236

Najera, William
pointlessoblio@yahoo.com
PHONE: (870) 856-4204
FAX: ****
5 units shipped in 1 order/s

St. John Bosco Academy
33 Divine Mercy Way
Hardy, Arkansas 72542

Orthous, Gabriel
orthous@gmail.com
PHONE: (678) 296-4271
FAX: ****
1 units shipped in 1 order/s

160 Ridge Way
Roswell, Georgia 30076

Peroldo, Juan
orthous@gmail.com
PHONE: (305) 234-0244
FAX: ****
1 units shipped in 1 order/s

8250 SW 130th Street
Miami, Florida 33156

Puerta, Maria Virginia S.
sanchezpuerta@gmail.com
PHONE: 542614135000
FAX: ****
11 units shipped in 1 order/s

1767 22nd Street North
Arlington, Virginia 22209

Sanders, Jeffery
jeffs5831@yahoo.com
PHONE: (615) 683-4371
FAX: 615-683-6048
1 units shipped in 1 order/s

Sanders Bros Farm
P.O. Box 112
Brush Creek, Tennessee 38547

Thomas, Lana
lana_f_thomas@yahoo.com
PHONE: (803) 957-7434
FAX: ****
1 units shipped in 1 order/s

Thomas Farm
213 White Horse Road
Lexington, South Carolina 29073

Veilleux, Dr. Richard
potato@vt.edu
PHONE: (540) 231-5584
FAX: 540-231-3083
36 units shipped in 2 order/s

Virginia Polytechnic Institute
Department of Horticulture
Blacksburg, Virginia 24061-0390

Walker, Clarence W.
clarencewwalker@bellsouth.net
PHONE: (770) 606-0459
FAX: ****
24 units shipped in 1 order/s

36 Miltons Walk
Cartersville, Georgia 30120

**** = INFORMATION NOT PROVIDED BY COOPERATOR

GENERAL REPORTS

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 2010, 84,644 first-year seedlings representing 657 families were grown, and 573 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 will be released in 2011. Plant Variety Protection has been granted for Rio Rojo (NDTX4304-1R). A major effort continued in 2010 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 characterizing the anti-prostate cancer properties of selected potato accessions. Germplasm was screened for total phenolic (TP) and antioxidant activity (AOA), and *Solanum kurtzianum* was selected for further investigation based on antiproliferative activity observed in prostate cancer cell cultures. However, due to high levels of glycoalkaloids, it was replaced with *S. bulbocastanum* (PI243510), which contains fewer glycoalkaloids but has comparable TP and AOA. To further evaluate the anti-cancer properties of *S. bulb.* prostate cancer cells were injected into the dorsal flanks of mice to induce tumor development. Following the development of palpable tumors, mice were orally administered bioactive compounds extracted from tubers of *S. bulb*. Tumor volume was not significantly different between the treatments, but further analyses are necessary to determine potential differences in metastatic and angiogenic factors. 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 2010

Miller, C., D. Scheuring, and J. Koym. 2010. Texas Potato Breeding Report, 2009. Texas AgriLife Research, College Station and Lubbock. 386p.

Miller, J.C., Jr., J.W. Koym, D.C. Scheuring, and J.P. Miller. 2010. Southwest Regional Potato Variety Trial Report 2009. Texas AgriLife Research, College Station and Lubbock. 22p.

Miller, C., J. Koym, and D. Scheuring. 2010. 2010 Field Day Handbook. July 15, 2010. Texas Potato Variety Development Program. Texas AgriLife Research, College Station and Lubbock. 33p.

Turner, S.D., J.C. Miller, Jr., and R.D. Lineberger. 2010-. Texas A&M University Potato Breeding and Variety Development Program. http://potato.tamu.edu

Peer-reviewed manuscripts.

Brown, C. R., K.G. Haynes, M. Moore, M.J. Pavek, D.C. Hane, S.L. Love, R.G. Novy, and J.C. Miller, Jr. 2010. Stability and Broad-sense Heritability of Mineral Content in Potato: Iron. Amer. J. Potato Res. 87:390-396.

Reddivari, L., J. Vanamala, S.H. Safe, and J.C. Miller, Jr. 2010. The bioactive compounds α - chaconine and gallic acid in potato extracts decrease survival and induce apoptosis in LNCaP and PC3 prostate cancer cells. Nutr. and Cancer. 62(5): 601-610.

Blessington, T., M.N. Nzaramba, D.C. Scheuring, A.L. Hale, L. Reddivari, and J.C. Miller, Jr.,. 2010. Cooking methods and storage treatments of potato: Effects on carotenoids, antioxidant activity, and phenolics. Amer. J. Potato Res. 87:479-491.
Jansky, S. and J.C. Miller,Jr. 2010. Evaluation of Verticillium wilt resistance in Russet Norkotah and six strain selections. Amer. J. Potato Res. 87:492-496.

North Carolina - G. Craig Yencho and Mark Clough

The goal of the North Carolina breeding program is to develop potato cultivars that are adapted to NC and the SE US. Our project is a member of the NE1031 Regional Potato Variety Development Project and we collaborate with the USDA-ARS, Univ. of Maine (ME) and Cornell University (NY) potato breeding programs, as well as other potato breeding programs in the US. The potato breeding efforts in the eastern US are designed to take advantage of the existing strengths and resources of the potato research community through the pooling of regional resources. This promotes increased communication within the potato community located in the northeast, mid-Atlantic and southeast, and results in improved variety utilization.

Specific project outcomes of the project are as follows: 1) potato breeders share breeding materials and test results; 2) USDA NRSP 6 potato germplasm is evaluated and selections derived from this germplasm under diverse environmental conditions by all the breeding programs in the eastern US because several programs routinely obtain and evaluate germplasm from the potato genebank; 3) research and extension personnel evaluate new selections from several potato breeding simultaneously in regional trials; 4) germplasm is screened for specific disease characteristics at a single location where the technical expertise is present to do high quality evaluations (e.g. early blight and powdery scab resistance in PA); and 5) regionally appropriate variety profiles and cultural recommendations are developed for each new variety before they are put into commercial production.

Breeding and Variety Development at NCSU - The bulk of our breeding work is conducted at the Tidewater Research Station (NCDA&CS)/Vernon G. James Research and Extension Center (NCSU) in Plymouth, NC. We also conduct 4-5 on-farm trials each year as part of our variety development efforts. Crossing work is done at our greenhouses in Plymouth, and we grow and share mini-tubers with the USDA-ARS yearly, and with Cornell and Maine as materials are available. In 2010, we planted 13,260 single-hills were planted and 108 clones selected averaging a 0.8% selection rate. From the 872 clones in our 6-hill plots, 60 (6.9%) were selected. In the 20-hill plots, 73 clones were planted and 14 (19%) were selected. In our 60-hill plots, 15 clones were planted and 4 (27%) were selected.

Variety Evaluation - During 2010, 292 advanced and preliminary clones were evaluated in yield trials. Thirty-one of these were NE-1031 entries, 13 were entries from the Snack Food Association, 11 were from NCSU and the remainder were preliminary lines from USDA-ARS BARC, UM, CU, and MSU. The trials are described in detail in our 2010 NC Potato Variety Trial and Breeding Report, which was mailed to extension, research and industry cooperators and is on our website http://potatoes.ncsu.edu. The most promising lines included the round white, chipstock clones: AF0338-17, Harley Blackwell, NC0349-8, NCB2497-17, and NY140. The tablestock clones: NY136 (red skin, white flesh) and Vivaldi (tan skin yellow flesh), and B2152-17 (red skin, yellow flesh).

Our breeding and the yield trial results are summarized and can be viewed and downloaded at our website http://potatoes.ncsu.edu/. NC also hosts the website and database for the NE1031 project, which is also present at this site.

Germplasm Development (IHN) - To address the internal heat necrosis (IHN) problems endemic to the mid-Atlantic and southeastern states, we have been working on a long-term project with Dr.

Kathleen Haynes. The materials for this study were derived from 4x-2x S. tuberosum x (S. phureja X S. stenotomun (phu-stn)) hybrids developed by Dr. Haynes. Dr. Per McCord completed his PhD studies focused on identifying molecular markers (AFLP) associated with resistance to IHN in July 2009, and the results of his research have been accepted for publication in TAG and Crop Science (see below).

Germplasm Development (CPB) - Our Colorado potato beetle (CPB) germplasm enhancement project seeks to introgress CPB resistance derived from ber and chc into cultivated potato. The project began in 1998 using materials obtained from the USDA Potato Genebank, the USDA-ARS BARC, and CU. During 2010, we planted 1,432 2-hill plots for agronomic selection purposes and a duplicate set was planted for CPB nursery resistance screening. The data collected in the nursery was used as a major but not exclusive selection criteria, resulting in 76 clones advanced for CPB screening as two replicated 3-hill plots (2by3 trial), and for parallel adaptation selection as non-replicated 6-hill plots in 2011. In this year's 2by3 trial, 67 clones were evaluated for CPB resistance and adaptation in our non-replicated 6-hill plots simultaneously. After selections in both of these trials, we advanced 10 clones to next year's screening trial of three replications with 5-hills (3by5 trial) and for parallel horticultural adaptation selection as non-replicated 20-hill plots in 2011. In this year's 3by5 trial we evaluated 28 clones for CPB resistance and adaptation in non-replicated 20-hill plots simultaneously. We selected 5 clones for advancement to next year's 3by10 and our non-replicated 60-hill trial. The 3by10 trial is open to collaborators in other states. Our 2010 trial included clones from NDSU, a clone submitted for evaluation by the UM and our own materials and totaled 14 clones.

Reports Produced in 2010

Yencho, G.C. and M.E. Clough. 2010. North Carolina Potato Variety Trial and Breeding Report, 2009. NC State University, Raleigh, NC. 41 pp. (http://potatoes.ncsu.edu/Reports.html)

Peer-reviewed manuscripts.

Clough, M., G. Yencho, B. Christ, W. DeJong, D. Halseth, K. Haynes, M. Henninger, C. Hutchinson, M. Kleinhenz, G. Porter, and R. Veilleux. 2010. An interactive online database for potato varieties evaluated in the eastern US. HortTechnology 20:245-249.

McCord, P.H., B.R. Sosinski, K.G. Haynes. M.E. Clough and G.C. Yencho. 2011. Linkage mapping and QTL analysis of agronomic traits in tetraploid potato (*Solanum tuberosum* subsp. *tuberosum*). Crop Sci. 51: 771-785.

McCord, P.H., B.R. Sosinski, K.G. Haynes. M.E. Clough and G.C. Yencho. 2011. QTL mapping of internal heat necrosis in tetraploid potato. Theor Appl Genet 122:129–142.

Virginia– Richard Veilleux

A project designed to estimate the possibility of gene flow between transgenic potato and native Colombian potato species was completed. Seed set was obtained between Colombian species (*Solanum andreanum, S. Colombianum, S. flahaultii, S. andreanum, S. tuberosum subsp. andigenum*) and transgenic diploid selections of *Solanum phureja* that expressed green fluorescent protein (GFP). The production of viable GFP positive seedlings indicated that transgenic potato production in Colombia would likely result in the contamination of native species by escaped transgenes.

Four genes in the steroidal glycoalkaloid (SGA) biosynthetic pathway were screened for single nucleotide polymorphisms (SNP) that resulted in amino acid changes to the encoded protein products of *Solanum chacoense* (high SGA) and *S. phureja* (low SGA).

A population of activation-tagged lines of diploid potato has been generated after transformation of the monoploid progenitor (BARD 1-3 516) of the doubled monoploid (DM 1-3 516 R44) that was used for potato genome sequencing. The regenerated doubled monoploids carrying the full activation tag construct (both *Ac* and *Ds*) were outcrossed to closely related male fertile seedlings. Resulting progenies were characterized for transposition of the *Ds* element and the positions of transposition within the genome. Transposants were backcrossed as pollen parents to the doubled monoploid to fix the transpositions in seedling populations that would not require tissue culture maintenance.

Peer-reviewed manuscripts

Clough M.E., Yencho G.C., Christ B., DeJong W., Halseth D., Haynes K., Henninger M., Hutchinson C., Kleinhenz M., Porter G.A., Veilleux R.E. 2010. An interactive online database for potato varieties evaluated in the eastern United States. HortTechnology 20:250-256.

Boluarte T, Manrique Carpintero NC, Piovano SM, Pereira A, Veilleux RE. 2011. Activation tagging in potato: Developing a population of mutants to facilitate genetic studies. Amer. J. Potato Res. 88:31 (Abstr.)

Manrique Carpintero NC, Piovano SM, Tokuhisa J, Ginzberg I, Veilleux RE. 2011. SNP discovery at candidate genes in the glycoalkaloid biosynthetic pathway of potato. Amer. J. Potato Res. 88:54 (Abstr.)

Porter GA, DeJong W, Haynes KG, Yencho GC, Gergela D, Clough ME, Freeman J, Veilleux RE, Henninger ME, Christ BJ, Halseth DE, MenashaS, Kleinhenz M. 2011. Breeding, selection, and Development of potato varieties in the eastern United States. Amer. J. Potato Res. 88:62 (Abstr.)

Veilleux RE, Boluarte-Medina T, Manrique-Carpintero N, Piovano SM, Pereira A, Carter JD, Lu N. 2011. Transposon tagging in monoploid derivatives of potato Plant & Animal genomes XIX conference, January 15-19, 2011, San Diego (Abstr.) http://www.intl-pag.org/19/abstracts/P05g_PAGXIX_443.html

Western Region Report to NRSP-6 Technical Committee

Fahrettin Goktepe

June 28-29, 2011

During 2010, the Potato Introduction Station (NRSP-6, Sturgeon Bay, WI) supplied potato materials to the following Western states: California, Idaho, Oregon, Utah, Hawaii and Washington (Table 1). Requests from Colorado, and Arizona (in italics in Table 1) were not included in this report. Western Regional USDA/ARS orders are reported separately.

A total of 586 units were distributed to the Western Region. Washington State ordered 154 units (27%), California 85 units (15%), Idaho 66 units (11%), Oregon 209 units (36%), Utah 6 units (1%) , and Hawaii 15 units (3%) (Figure 1). Potato materials were requested from universities (University of California, University of Idaho, Oregon State University, and Washington State University), private companies (i.e. Simplot, Bejo Seeds, Potandon Produce LLC, Cibus US LLC and Thomas Wagner) and individual farms. The private sector was very active by requesting almost half of the potato clones distributed to Western Region in 2010: Thomas Wagner requested 127 units, J.R. Simplot requested 39 units, Potandon Produce LLC requested 25 units, Cibus US LLC requested 33 units and Bejo Seeds, Inc. requested 26 units. Almost a half of people sent brief reports, double reporting requests and phone calls (from me representing NRSP-6),some of the germplasm users weren't able to provide much information since they left the company they were with or materials weren't under their possession anymore. Without any exception, everybody was very appreciative of the service and materials provided by NRSP-6. They strongly expressed that the genetically diverse material received from NRSP-6 is one of the key factors to address today's potato industry's needs and new born constrains. Various research initiatives among faculty members at the Land-grant universities clearly indicated that the service and germplasm materials provided by NRSP-6 will help to assure that US has a sustainable potato industry. Overall, these materials will greatly position the worldwide potato industry to respond and overcome the future challenges and obstacles. The materials received from NRSP-6 were in good conditions and the quality was extremely high as experimental materials.

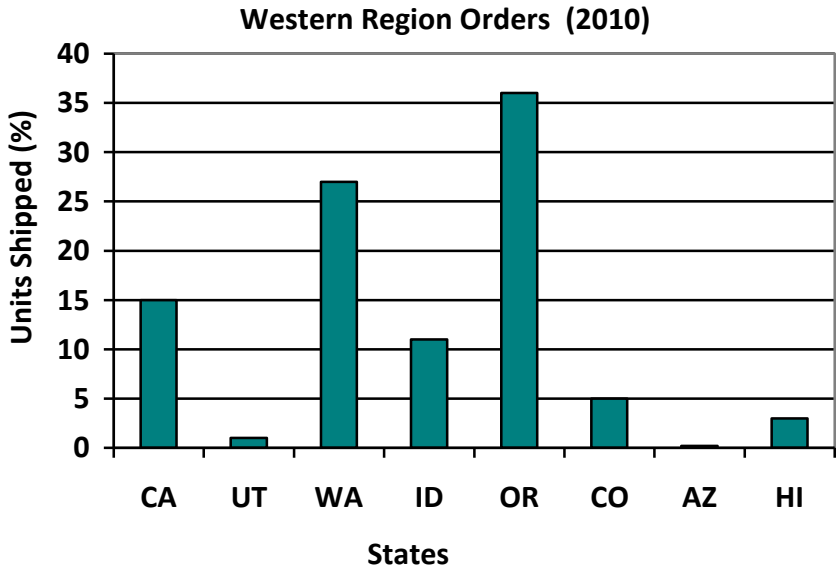

Figure1. The percent unites distributed to Western Region in 2010

Germplasm materials have been used for various research and development objectives;

a) Disease resistance:

- PVY; the most harmful disease in cultivated potato
  - Tuber yield and quality
  - Limited generation seed production
  - Source of resistance: *S. tuberosum ssp. andigena* (Ry_{adg}) and *S. stoloniferum*(Ry_{sto})
- Colombia root knot nematode (CRKN) (*Meloidogyne chitwoodi*)
- Late Blight
- Other plant pest and pathogens (, potato tuber worm, powdery scab, black dot, and *Verticillium* wilt)

b) Health attributes(phytonutrient components):
- thiamine and folate,

c) Molecular genetic studies:
- cold regulated genes
- genetic diversity study

d) New cultivars for organic potato production
- Cultivar development: specialty types, standard types

e) Heat and drought tolerance

f) Teaching and Education

In Summary:

- Ongoing needs of germplasm and continuous incorporation into the breeding program to develop diverse potato cultivars: russets, reds, chippers and specialties
- New cultivars assist to overcome some of the obstacles which today's potato industry is facing such as ongoing threats from potato pests and pathogens, processing concerns and post harvest problems.
- They come with great potentials to open up new avenues and markets for the development of competitive and vigorous potato industry both domestic and worldwide.
- New potato cultivars also provide healthy, adequate and diversified food source for the consumers.
- Potato germplasm materials from NRSP-6 serve the faculty members at the Land –grant universities to conduct basic research projects with the various objectives.

**** = INFORMATION NOT PROVIDED BY COOPERATOR

Germplasm from NRSP-6

1. **Aymeric Goyer, PhD** Oregon State University Hermiston Agricultural Research and Extension Center,Hermiston, OR 97838

In 2010, we received tubers from 87 primitive cultivars and 73 wild species for testing for thiamine and folate contents. We have identified genotypes with relatively high thiamine and high folate contents. In collaboration with Charles Brown, we have made crosses between high thiamine primitive cultivars and a Russet variety and/or a universal diploid tuberosum. We are now planning on testing segregants.

Publications:

Goyer A (2011) Vitamin B_1 content in potato: effect of genotype, tuber enlargement, and storage, and estimation of stability and broad-sense heritability. (In print in the *American Journal of Potato Research*)

Goyer A (2011) Thiamine and folate in potato: targets for increased nutritional value and enhanced disease resistance. Amer. J. Potato Res. 88:40-41
Goyer A (2010) Why and how to increase the contents of vitamins in potato? Proceedings of the 1st Annual Washington Oregon Potato Conference, Kennewick, WA, January 26-28, 2010. pp. 14-20.
The materials were of very good quality and were received in excellent conditions.

2. Joseph's Garden: Box 538 Paradise, Utah 84328 eMail: Garden@Lofthouse.com

Thank you for your request for a progress report, received six potato seed accessions from GRIN in the spring of 2010. I'm reporting on the use of the seeds which are being incorporated into my potato breeding program.
I am an organic farmer in Northern Utah seeking to expand the genetic diversity of my potato crop, and to develop a potato land-race that is more adapted to my unique growing conditions and pests: High altitude, sun-drenched, low humidity, short season, well irrigated, desert garden rooted in limestone derived lake sediments. In addition to the seeds I received directly from GRIN, I am also growing about 30 lines of potatoes from true seeds. Many of these lines contain genes that came indirectly from GRIN via other growers: the descendents of seed collected in Bolivia, Peru, and the Andes. In the 2010 growing season seeds from each accession were planted indoors under grow lights immediately upon arrival. Due to arriving in late spring, damage from a hail storm, and an unusually early frost in my normally short growing season, no tubers were produced in the 2010 growing season. The two accessions that grew best in the field were **PI 558369** and **PI 245847.** Accession **PI 458369** did not grow at all. The others were killed by hail.
During the 2010/2011 winter the accessions were grown indoors under grow lights hoping to produce tubers for planting in the spring: Two accessions produced 10 mm sized tubers in 120 days: **PI 558369** and **PI 245847.** Accession **PI 458393**, produced one 2 mm tuber. After producing tubers, shoots from **PI 558369**, were rooted for transplant into the garden. The tubers are currently being acclimatized to break dormancy and will be planted out soon.
Based on previous growth patterns **PI 558369** and **PI 245847** seeds were replanted and are currently growing in pots preparatory to being transplanted into the field after our last expected frost.
Of the thirty or so varieties of potatoes that I have grown from true seeds **PI 558369** may be the most robust. The seedlings germinate quickly, are hardy, and grow vigorously. Early growth is an order of magnitude faster than for my other varieties.

One of the potato plants that I grew from true seed last summer produced tubers that were not damaged by wire-worms or scab: the two biggest problems for potatoes in my garden. The seed came from a grower who has used GRIN seed in his breeding program, so it's possible that some of it's genes may have arrived in my garden by way of GRIN.
Thank you for your seeds, they are a welcome addition to my breeding program. I'd welcome another request for feedback this fall. From time to time I will update progress at:
HTTP://GARDEN.LOFTHOUSE.COM/TRUE-POTATO-SEED-SOUTH-AMERICA.PHTML

3. Michael Wing, Science Teacher Sir Francis Drake High School San Anslemo, California

In 2009 and again in 2010 Sir Francis Drake High School received small samples (several tubers) of the potato cultivar "Alaska Frostless." Both times the tubers were received in great condition. Our purpose was to plant them in our experimental alpine cold frame at an elevation of 12,470' in California's White Mountains. We had excellent success with them in 2009, and harvested a large crop from a plot just 2' x 2.5' in area. You can see a photo of some of them at

http://drake.marin.k12.ca.us/staff/wing/WMRS_Project.htm This must be a North American record for growing potatoes at altitude.
Heavy snow in 2010 prevented us from reaching the cold frame until July. Our late planting, plus some problems with our automatic irrigation system meant that our 2010 potato crop failed. Some wheat we planted did well, though.
No publication has resulted from this high school project yet, except our project's own web site. The United States Potato Genebank is credited on this page
http://drake.marin.k12.ca.us/staff/wing/WMRS_Thanks.htm
Thank you very much for helping us!
Sincerely yours,

4. Richael, Craig Craig.Richael@simplot.com

I did receive 3 S. tuberosum accessions from the germplasm repository. They were:
PI 511845 Serrana
PI 537035 Stobrawa
PI 633602 Sheriff
As Whitworth et al. 2009 (Am J Pot Res, 86:286-296) identified these accessions as being PVY resistant but not harboring markers for known resistance genes, we hoped characterize the resistance found in these breeding lines/accessions. However, between the time we conceived the notion and the time we received the plants, our plans changed. We never did anything with this material. Sorry. We appreciate your repository and the service you provide.

5. Peter van Hest, Ph.D. Bejo Seeds, Inc.Oceano, California.

In response to your request on the use of NRSP6 germplasm by Bejo seeds, Inc., I hereby respond.
For about the last 10 years, Bejo Seeds, Inc annually selects up to 50 lines available at the NRSP-6 for distribution. The material is seeded, transplanted or planted and evaluated for use in our potato breeding program in California.
Material received has always been in good phytosanitary state. Roughly 5 % is retained for further evaluation and use within our program.
Once we have lines to register as new potato varieties, whether clonal or in the form of true seed, and NRSP-6 germplasm has contributed to that line, we will acknowledge it at that time and credit the NRSP-6 program for providing the lines.
I trust this is satisfactory for your report.
Sincerely,

6. Jeff Bragg and Larissa Dawson Potandon LLC

We received the tubers on 4/20/10. They were in a Styrofoam cooler in paper bags. For lack of a humidified cold room, we stored them in a refrigerator. We planted the tubers 6/2/10. When we did plant, the seed was not in great condition. The tubers were very small to begin with, and the lack of humidity present caused the tubers to dehydrate. Many were not healthy enough to grow. We were hoping to be able to evaluate different lines for how they grow in our specific commercial area. We were unable to obtain sufficient data at harvest to draw conclusions.

7. - Joe Kuhl University of Idaho Department of PSES Moscow, Idaho

The seed from S. acaule and S. chacoense accessions arrived in excellent shape. The seed successfully germinated and produced seedlings, from which root tips were collected and were used as controls in chromosome counts, tetraploid and diploid, respectively. No publications have been generated to date. Please let me know if additional information is needed.

8. Linda Mustard Crestview farm Montesano WA

I have recieved it and it came in good condition,and the quality was great. I grew it in a container which worked very well as the weather conditions were not great for planting it outside, and it did very well. I would not hesitate planting this variety in abundance. And will try planting it again as soon as the ground is dry enough to see how it fairs in the ground with this climate. Thank you very much. Sincerely, Linda Mustard

9. Tom Wagner Everret WA

Yes, the material received was great.
I am using the resources for breeding and evaluation purposes. I make reports often on my forum tatermater.proboards.com that creates excitement for the diversity of potato clones, TPS, and all research thereof.
The scope of my work is to convert TPS and clonal lines into more TPS for the future.

10. James West MSC Grand Junction CO

I am sorry to inform you that I never received the package. There were several other seed packages that were not delivered during this time. I live in an area where the postal system is not known for its proficiency . plantman50@yahoo.com

11. Tony Chen, Oregon State University Corvallis, OR

We have had a paper published online using the materials I requested in the past. Please see an attached pdf file. Thanks
A comparison of the low temperature transcriptomes and CBF regulons of three plant species that differ in freezing tolerance: Solanum commersonii, Solanum tuberosum, and Arabidopsis thaliana
Marcela A. Carvallo1,*, Marı´a-Teresa Pino2, Zoran Jeknic´ 2, Cheng Zou3, Colleen J. Doherty1,*, Shin-Han Shiu3,
Abstract
Solanum commersonii and Solanum tuberosum are closely related plant species that differ in their abilities to cold acclimate; whereas S. commersonii increases in freezing tolerance in response to low temperature, S. tuberosum does not. In Arabidopsis thaliana, cold-regulated genes have been shown to contribute to freezing tolerance, including those that comprise the CBF regulon, genes that are controlled by the CBF transcription factors. The low temperature transcriptomes and CBF regulons of S. commersonii and S. tuberosum were therefore compared to determine whether there might be differences that contribute to their differences in ability to cold acclimate. The results indicated that both plants alter gene expression in response to low temperature to similar degrees with similar kinetics and that both plants have CBF regulons composed of hundreds of genes. However, there were

considerable differences in the sets of genes that comprised the low temperature transcriptomes and CBF regulons of the two species. Thus differences in cold regulatory programmes may contribute to the differences in freezing tolerance of these two species. However, 53 groups of putative orthologous genes that are cold-regulated in S. commersonii, S. tuberosum, and A. thaliana were identified. Given that the evolutionary distance between the two Solanum species and A. thaliana is 112–156 million years, it seems likely that these conserved coldregulated genes—many of which encode transcription factors and proteins of unknown function—have fundamental roles in plant growth and development at low temperature.
Journal of Experimental Botany pp 1-13

12. Terese Allen: Puyallup School District Glacier View Junior High Puyallup WA

The potato germplasms arrived in tact and appeared healthy. There was no evidence of fungal growth (which is often the case in the Pacific North West) or disease. The soil is quite nutrient deficient with hard pan, sand and clay being predominant. There is a slightly higher acid content as well. The area identified to plant these germplasms receives morning sun with partial afternoon shade. The soil has been amended with compost from yard waste, steer manure and chicken manure. Previous plants grown in this area include herbs.
As I ordered the germplasm in the fall and just planted them in the spring, I cannot report out beyond where they are in their growth cycle at this time. Given the record amounts of rain in this area this spring, several of the germplasms did not grow, rotting in the ground. There are a couple just now starting to get some good leaf growth. My hope was to identify plants resistant to mildew, fungi and a variety of disease we see in the Pacific North West (such as powdery mildew and black spot). I also want to know how the slugs, aphids and black beetles react to the plants. Will the plants be impacted by these influences. So far no powdery mildew or black spot. Some slug activity is noted, however no aphids or black beetle larva problems.
As I said before, we are in early stages. I will be interested in seeing how things turn out. Thank you for making this service available.

13. Richard Pender, PhD Candidate, University of Hawaii at Manoa.

Five potato (*Solanum tuberosum*) cultivars (Red Pontiac, Katahdin, Krantz, Bintji, and Desiree) were received from the United States Potato Genebank (NRSP-6) in 2010. The ex-plants were packaged well and arrived in excellent condition. We requested these plants for use in a project that aimed to assess the potential gene flow between commercial potato cultivars and 3 native Hawaiian *Solanum* species. We propagated and established plants of each of the cultivars. However, the humid tropical climate and high rainfall of our study site made growing the plants to flowering size very difficult. Because of these difficulties, combined with the very low risk of gene flow from *S. tuberosum* to Hawaiian *Solanum* species, we abandoned the project at the end of 2010.

14. Rick Machado, Machado farm, CA

I received several S. Korean varieties, including Juice Valley, Gogu Valley, Stick Valley and several others. All arrived in excellent condition, ready or almost ready to plant. We are looking for heat and drought tolerance, and the Bora valley has been a very reliable tuber to work with. So we are hoping we can pick up more tubers that work as well. The first harvest was very good, although we put them in very good conditions the first year. This year we have them in more sub conditions, with longer periods between watering. We also have several numbered varieties that are in their first year, and we have not harvested yet. So we will wait on results. We are also going to be harvesting some tubers and

TPS from a Bora Valley x s.chacoense. We will report on those next year. We have been very happy with all our selections, and kind and generous help from both Max and Jesse. We look forward to creating new lines that all of us can use.

2010 WESTERN ORDERS **Monday, May 16, 2011**

Adams, James
adams_jm@yahoo.com
PHONE: (509) 230-3225
FAX: ****
4621 E 65th Ave
Spokane, Washington 99223
2 units shipped in 1 order/s

Allen, Terese
allente@puyallup.k12.wa.us
PHONE: (253) 435-6904
FAX: ****
Puyallup School District
Glacier View Junior High
Puyallup, Washington 98374
6 units shipped in 1 order/s

Bartholomew, Sunshine
snowbunnysunnyb@yahoo.com
PHONE: (253) 639-1536
FAX: ****
Kooley Farms
12301 118th Avenue SE
Rainier, Washington 98576
1 units shipped in 1 order/s

Bradford, Philip
selfreliantmidland@gmail.com
PHONE: (360) 584-5918
FAX: ****
Self Reliant Community of Midland
1212 85th Street E
Tacoma, Washington 98445
26 units shipped in 1 order/s

Brafford, C.J.
projects@friendsofutemuseum.org
PHONE: (970) 249-3098
FAX: ****
Ute Indian Museum
17253 Chipeta Drive
Montrose, Colorado 81401
11 units shipped in 1 order/s

Bragg, Jeff
jbragg@potandon.com
PHONE: (208) 524-1900
FAX: ****
3242 South Woodruff
Idaho Falls, Idaho 83404
25 units shipped in 1 order/s

Chen, Dr. Tony
chent@hort.oregonstate.edu
PHONE: (541) 737-5444
Oregon State University
Department of Horticulture
Corvallis, Oregon 97331

FAX: 541-737-3479
7 units shipped in 2 order/s

Christiansen, C. Scott
salmonslayer1991@yahoo.com
PHONE: (253) 355-6457
FAX: ****
4 units shipped in 3 order/s

Oregon State University
2730 SE 7th Avenue #3
Albany, Oregon 97322

Clark, Carlton
az_joe@hotmail.com
PHONE: (928) 692-0161
FAX: ****
1 units shipped in 1 order/s

2537 Emerson Avenue
Kingman, Arizona 86401

Goyer, Aymeric
aymeric.goyer@oregonstate.edu
PHONE: (541) 567-8321
FAX: (541) 567-2240
164 units shipped in 2 order/s

Oregon State University
Hermiston Agricultural Research & Ext
Hermiston, Oregon 97838

Holm, Dr. David G.
spudmkr@lamar.colostate.edu
PHONE: (719) 754-3594
FAX: 719-754-2619
18 units shipped in 2 order/s

Colorado State University
San Luis Valley Research Center
Center, Colorado 81125

Kuhl, Joseph
jkuhl@uidaho.edu
PHONE: (208) 885-7123
FAX: ****
2 units shipped in 1 order/s

University of Idaho
Department of PSES
Moscow, Idaho 83844-2339

Lofthouse, Joseph
garden@lofthouse.com
PHONE: (435) 237-9112
FAX: ****
6 units shipped in 1 order/s

Joseph's Farm
96 North Center Street
Hyrum, Utah 84319

Machado, Rick
farmrik@gmail.com
PHONE: (909) 672-3094
FAX: ****
7 units shipped in 1 order/s

Machado Farms
26501 Wickard Road
Menifee, California 92584

Mulhair, Corey
mulhair.corey@gmail.com
PHONE: (408) 504-8241
FAX: ****
8 units shipped in 1 order/s

Foothill College
Horticulture Department
Cupertino, California 95014

Mustard, Linda
suelmustard@gmail.com
PHONE: (360) 249-6859
FAX: ****
2 units shipped in 1 order/s

Crestview Farm
104 Brady Loop Road E
Montesano, Washington 98563

Pender, Richard
thatplantguy@gmail.com
PHONE: (808) 489-6536
FAX: ****
15 units shipped in 1 order/s

College of Tropical Agric.
3190 Maile Way
Honolulu, Hawaii 96822

Radtke, James
jradtke@cibusllc.com
PHONE: (612) 308-4096
FAX: ****
15 units shipped in 1 order/s

Cibus US LLC
4025 Sorrento Valley Blvd.
San Diego, California 92121

Richael, Craig
craig.richael@simplot.com
PHONE: (208) 327-3298
FAX: 208-327-3290
9 units shipped in 1 order/s

JR Simplot
Plant Sciences Division
Boise, Idaho 83706

Rommens, Dr. Caius
crommens@simplot.com
PHONE: (208) 327-3287
FAX: ****
30 units shipped in 1 order/s

Concepts in Plant Biotechnology
5369 W. Irving Street
Boise, Idaho 83706

Tussing, Jessica
jessie_jeff@msn.com
PHONE: (503) 741-0968
FAX: ****
1 units shipped in 1 order/s

Taylorville Farm
Winter Sufficiency Project
Clatskanie, Oregon 97016

Vales, M. Isabel
isabel.vales@oregonstate.edu
PHONE: (541) 230-4093

Oregon State University
Dept of Crop and Soil Science
Corvallis, Oregon 97331

FAX: 541-737-1589
33 units shipped in 1 order/s

van Hest, Peter
pvanhest@bejoseeds.com
PHONE: (805) 473-2199
FAX: 805-473-0897
Bejo Seeds, Inc
1972 Silver Spur Place
Oceano, California 93445
26 units shipped in 1 order/s

VanDerwarker, Amber
vanderwarker@anth.ucsb.edu
PHONE: (805) 893-8604
FAX: 805-893-8707
University of California
Departmetn of Anthropology
Santa Barbara, California 93106-3210
10 units shipped in 2 order/s

Wagner, Thomas
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PHONE: (425) 512-0313
FAX: ****
8407 18th Avenue West
Everett, Washington 98204
127 units shipped in 2 order/s

Walker, Andrew
awalker@cibusllc.com
PHONE: (858) 450-0008
FAX: ****
Cibus US LLC
4025 Sorrento Valley Blvd.
San Diego, California 92121
18 units shipped in 1 order/s

West, James
plantman50@yahoo.com
PHONE: (987) 243-4495
FAX: ****
MSC
PO Box 202
Grand Junction, Colorado 81502
7 units shipped in 1 order/s

Wing, Dr. Michael R.
wing@marin.k12.ca.us
PHONE: 415-453-8770
FAX: ****
58 Redwood Drive
Kentfield, California 94904
1 units shipped in 1 order/s

Summary of the Clonal and True Potato Testing at the Plant Germplasm Quarantine Program

NRSP-6 Technical Committee Meeting
Sturgeon Bay, WI / June 28-29, 2011

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
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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 and further use of clean germplasm.

Accomplishments

Over the past year our PGP continue improving pathogen detection tests for potato diseases. This includes biological and molecular based methods. This year we consolidated the routine use of group tests with generic primers for RT-PCR for: luteoviruses, carlaviruses, potexviruses, potyviruses, and PCR for geminiviruses and phytoplasmas. We also have a qRT- PCR (real time) test ready for *Potato yellow vein virus*. Conventional RT-PCR test for pospoviroids along with a qPCR for PSTVd are also in the pipe line. Therapy continuous to be primordial in our program for the elimination of viruses in infected accessions. Cryotherapy still in the radar and hopefully implemented this year.

Our primary stakeholders continue to be potato Breeders from universities, government and the private industry. However, this season we introduce true potato seed (TPS) for a non-profit company in California. Those seed will be used to produce potatoes for consumption directly from TPS. We are also introducing TPS for *Solanum microdontum*, which is going to be used in multiple trait breeding experiments by the Genebank in Sturgeon Bay.

Clonal Testing at the Potato Quarantine Program

There were 72 potato clones in the PGQP in the 2010-2011 season. From those, six accessions were received as tubers and 66 as *in vitro* cultures. All summarized in the following tables:

Table 1.- Clonal Potatoes

There were 72 potato clones in the PGQP in the 2009-2010 season.

	Sixty-six were received *in vitro:*			
1	clone was received in 2007	1	from Ireland	for R. Novy
2	clones were received in 2008	1	from Scotland	for G. Secor
		1	from Peru	for D. Douches
7	clones were received in 2009	7	from Chile	for G. Secor
56	clones were received from May to November 2010			
		29	From Netherlands	for R. Novy
		12	from Spain	for M. Martin
		4	from Slovenia	for J. Whitworth
		4	from Poland	for J. Petrick
		4	from Germany	for S. Aarestad
		2	from Columbia	for G. Jander
		1	from Peru	for C. Brown
	Six were received as tubers:			
6	clones were received in 2010	1	from Japan	for J. for J.Kuhl
		5	from Scotland	for R. Novy

Of these 72 clones:
2 were too small to test and were held
until next season.

Table 2.- Accessions tested:

70 were tested:

5 were positive (PLRV, Potyvirus, and PVS)
65 were released

Table 3.- True Potato Seed

There were 20 TPS lots tested in the PGQP in the 2010-2011 season.

17 True Potato Seed lots were sown at the Potato Repository in Sturgeon Bay, WI for J. Bamberg and M. Martin.

6	from Argentina
5	from Bolivia
5	from the Russian Federation
1	from The Netherlands

3 TPS seed lots were grown and tested at PGQP

3	from Peru	for J. Kennard

All 20 seed lots were released.

SUMMARY 2010

Of the 72 clonal potatoes in the PGQP in the 2009-2010 season,
- 65 were released this year after testing was completed
- 5 tested positive and were sent to therapy
- 2 did not grow well, too small to test

True Potato Seed:
- 20 new seed lots were tested
- 20 were released

2011 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, JACK OKAMURO, SALLY SCHNEIDER, ROY SCOTT, GAIL WISLER, DA KAY SIMMONS)

1 **Personnel changes:**

1.1 Farewell and best wishes to Steve Clement, who retired as Research Entomologist at Pullman; Chuck Simon, who retired as Grape Curator at Geneva; and Doug Cook who retired as IT specialist at Corvallis.

1.2 Welcome to Dan Barney, new curator at Palmer, AK; Noelle Barkley, new peanut curator at Griffin, GA; Osman Gutierrez, cacao geneticist at Miami, FL; and Pablo Jourdan, new director of the Ornamental Plant Germplasm Center, Columbus, OH. Kim Hummer, the Research Leader for the Corvallis, OR genebank, is also now providing research and technical leadership for the NAPGRU at Palmer, AK. 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 is partnering 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 will be ARS's existing GRIN, which already houses information about the more than 541,000 accessions of more than 13,000 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. The project will conclude in mid-2011.

2.2 Citrus species are highly susceptible to many lethal diseases, damaging pests, and low temperatures. Genetic resources of citrus varieties are often reproduced as clones, and are currently maintained in field orchards and screen houses at the joint ARS-University of California NCGR at Riverside, CA because long-term storage of citrus clonal vegetative tissue has been infeasible. Researchers in the NCGRP at Ft. Collins, CO implemented new "micrografting" recovery methods that enable clonal citrus samples to be stored at the temperature of liquid nitrogen and successfully re-propagated. Storing duplicate clonal samples in secure genebank vaults will safeguard and enable them to be distributed to researchers more efficiently.

2.3 The genomes of wheat, barley and the biofuel crop switchgrass are so large and complicated that analyzing their genetic function and structure requires special genetic tools. Curators at the WRPIS in Pullman, WA greatly expanded the collection of genetic lines of Brachypodium, a small, rapidly flowering grass, with a relatively small genome which has been completely sequenced. Knowledge gained about this "model plant's" gene content, structure, and arrangement can be readily extended to small grains and bioenergy crops. Thus, by safeguarding and distributing this key "genetic tool," ARS genebanks are catalyzing efforts to map and manipulate key traits for genetically improving major crops.

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 Federal FY 11 budget was appropriated on 8 April 2011. As a result of the loss to ARS of earmarked projects, and budget rescissions the overall budget of the NPGS was reduced by about $700,000 from the FY 10 funding level.

3.3 The President's FY 12 budget proposes a substantial budget increase ($3.3 million) for the NPGS. Congress will determine whether to appropriate those funds during the House and Senate "mark-ups" of the President's FY 12 budget and the subsequent Conference Committee budget reconciliation. The House mark-up occurred on 24 May 2011, and it would reduce ARS's budget by more than 12%. The timing for the Senate mark-up is uncertain.

4 National Programs:

ARS's research portfolio is organized as a series of 22 national programs. Plant and microbial genetic resource management, genetic improvement, genomics, bioinformatics, and genomic database management are incorporated into National Program 301 (see the WWW at: http://www.nps.ars.usda.gov/programs/programs.htm?NPNUMBER=301). During 2007-2008, NP301 Project Plans were developed by ARS scientists and then were reviewed by thirteen peer review panels. 88% of the Project Plans were rating passing during the first review, with a median score of Minor Revision, a substantial improvement as compared to the first review cycle five years ago. The next NP 301 review cycle will begin at the end of 2011 and extend through 2012.

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 and 9 June 2010 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 plans to schedule new hearings on the IT during 2011, and to move it 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 their implementation.

Agriculture and Agri-Food Canada Report
to the NRSP-6 Technical Committee

B. Bizimungu

Sturgeon Bay, WI, July 28, 2011

Progress report

i) Introduction and Utilization of potato accessions from NRSP-6 Project

There are a number of research programs in Canada with active on-going potato improvement and or research utilizing NRSP-6 stock: Agriculture and Agri-Food Canada national potato genetic enhancement project is the major user, but others including provincial research programs/ university or private researchers periodically conduct potato research utilizing NRSP-6 stock.

During 2010, the Potato Introduction Station (NRSP-6, Sturgeon Bay, WI) supplied potato materials to researchers (at the following institutions in Canada: Agriculture and Agri-Food Canada, University of Montreal, and Hip Gnosis Seed Development Coop), totalling 91 units.

2010 CANADA ORDERS

Clark, Catherine L.
clarkc@agr.gc.ca
PHONE: (506) 452-3260
FAX: 506-452-3316
30 units shipped in 1 order/s

Agriculture and Agri-Food Canada
Potato Research Center - P.O. Box 20280
Fredericton, New Brunswick E3B 4Z7

De Jong, Dr. Henry
dejongh@em.agr.ca
PHONE: ****
FAX: ****
2 units shipped in 1 order/s

Agriculture and Agri-Food Canada
Potato Research Center - P.O. Box 20280
Fredericton, New Brunswick E3B 4Z7

Lachaume, Michel
jeanmlachaume@hotmail.com
PHONE: (613) 446-5776
FAX: ****
41 units shipped in 1 order/s

Hip Gnosis Seed Development Coop
504 Emerald
Rockland, Ontario K4K 0A4

Matton, Daniel P.
dp.matton@umontreal.ca
PHONE: (514) 872-3967
FAX: 514-872-9406
18 units shipped in 1 order/s

University of Montreal
Plant Biology Research Institute
Montreal, Quebec H1X 2B2

ii) **Utilization of potato accessions from NRSP-6 Project in the Agriculture and Agri-Food Canada (AAFC) National Potato Breeding project**

The national potato improvement efforts are consolidated at the Potato Research Centre where the core breeding and genetic enhancement is conducted, but has participants located at research centres contribute to the national efforts, especially the Lethbridge Research Centre (Alberta) in western Canada with a secondary breeding/evaluation site (adaptation to irrigated environment), and resistance germplasm (Colorado potato beetle, and late blight) research. A major focus of the AAFC national potato breeding program is the incorporation of genetic resistance to major diseases and pests (including late blight, PVY, PLRV, *Verticillium* wilt, the Colorado potato beetle), and cold-induced sweetening resistance into parental lines and/or adapted *S. tuberosum* material**.** Sources of those traits include S. *tuberosum* spp. *Andigena*, S. *tarijense*, S. *demissum, S. phureja, S. bulbocastanum, S. chacoense***,** *S. pinnatisectum,*and *S. oplocense***.** Many advanced potato clones were derived from this material provided by NRSP6. A number of clones developed from *S. oplocense* were evaluated for Colorado potato beetle resistance in a field trial. We studied the mode of resistance of *S. chomatophilum* to aphids using ethological and physiological tools. Clones from the same accessions showed differences in resistance level

Other recent research initiatives have resulted in increased requests and evaluation of new accessions or derived material from NRSP-6. These include PCN resistance breeding, evaluation of drought tolerance, new functional food uses such as antioxidant properties and resistant starch.

iii) Cultivar release:

Fifteen cultivars were granted national registration in Canada by the Canadian Food inspection Agency, including two Canadian-bred and six US-bred cultivars listed below, which contain exotic material from Potato Introduction Station (NRSP-6) in their pedigree.

1. Starburst (Conestoga /ND860-2), an early chipping cultivar.
2. Tenace (Frontier Russet /F87070), a golden nematode resistant fresh market cultivar.
3. GemStar Russet.
4. Bannock Russet.
5. FL 1922.
6. Eva K88-24, NY103.
7. Ivory Crisp
8. Alturas

iv) Potato Gene Resources Collection

The Agriculture and Agri-Food Canada's Potato Research Centre in Fredericton, NB is custodian of the Canadian potato genetic resources. This Repository is one node in the national gene banks system, which is coordinated through Plant Gene Resources Canada in Saskatoon, SK. The potato genetic

resources collection contains 161 clones, including modern Canadian-bred potato cultivars, heritage cultivars, and selected breeding parents. Accessions in the repository are maintained *in vitro* or as tubers. In addition to the long-term preservation of collection accessions, activities of the potato gene bank also include their evaluation for utilization purposes. Material from the collections is available on request to research, and academic communities in Canada and around the world. They are used to evaluate disease resistance, as well as for developing breeding and genetic lines for research and new commercial cultivars. A material transfer agreement is required before seed is released. Recent Newsletters can be obtained at
http://publications.gc.ca/site/eng/392756/publication.html

v) Publications

- Bizimungu, B., Holm, D.G., Kawchuk, L.M., Konschuh, M., Schaupmeyer, C., D.K., Wahab, J., Waterer, D., Driedger, D., Wolfe, H., McAllister, P., Howard, R., Platt, H.W. and Lynch, D.R. 2011. Alta Crown: Alta Crown: A new russet potato cultivar with resistance to common scab and a low incidence of tubers deformities. Am. J. Pot Res (2011) 88:72–81
- David De Koeyer. 2010. Unlocking beneficial genetic diversity for the Canadian environment. In Agriculture and Agri-Food Canada Potato Gene Resources Newsletter , Vol. 17, p3-4.
- Xiu-Qing Li, Jichong Zhang, Agnes Murphy, Benoit Bizimungu. 2010. Starch granule size variation in Canadian heritage potato varieties. In Agriculture and Agri-Food Canada Potato Gene Resources Newsletter , Vol. 17, p2-3.

Bamberg, Dr. John
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PHONE: (920) 743-5406
FAX: 920-743-1080

USDA, ARS
Potato Introduction Station
Sturgeon Bay, Wisconsin 54235

681 units shipped in 12 order/s. This is already detailed in the annual report. NRSP6 germplasm uses usually take the form of selecting and/or synthesizing custom materials to promote the evaluation work of specialist cooperators. Federal staff at the genebank "order" many units of germplasm every year for internal, "quality control" uses. These cover a range from very basic, like generating seed increase parents, to characterization functions like grow outs to score growth and flowering vigor of accessions within species.

Bethke, Dr. Paul
paul.bethke@ars.usda.gov
PHONE: (608) 890-1165
FAX: 608-262-4743

USDA, ARS
Department of Horticulture
Madison, Wisconsin 53706

37 units shipped in 4 order/s
We are using material to develop molecular markers for potato breeding
characterize gene expression and enzyme activities in PIs resistance to cold-induced sweetening

Brown, Dr. Chuck R.
chuck.brown@ars.usda.gov
PHONE: (509) 786-9252
FAX: 509-786-9277

USDA, ARS
WSU Irrigated Ag. Research Center
Prosser, Washington 99350

370 units shipped in 6 order/s
We have screened a number of wild potatoes for their ability to stimulate egg hatching of *Gloodera pallida*. If this is associated with non-host status these species would be a candidates for eradicativie trap crops for the nematode. It is already known that other Solanum species might fill this bill. *S. sisymbriifoium* and *S. quitoense*. The former is a very spiny wild *Solanum*. We have selected within five different accessions to reduce spininess. Within one accession we have made progress are in the process of producing seed for large scale testing. *S. sisymbriifolium* is self-incompatible and is adapted to pollination by buzz pollinators. Seed may be produced like synthetics with some selection for less spininess as time goes on. We have been looking at the more directed breeding of high carotenoids in potato using moleculoar markers within the genes beta carotene dehydroxylase and zeaxanthin epoxidase. The latter, zep, must be present only in its recessive form to boost total carotenoids to much higher leverls. At the tetraploid level this means that many crosses will produce none or just a few percent of high carotenoid progenies. Generating a high carotenoid tetraploid population fixed for recessive zep has been achieved. We are particularly interested in introducing the super high carotenoid trait and its accompanying rich

golden color to potatoes suitable for the french fry industry. At present dextrose is added to French fries before frying to achieve a golden brown color. The maillard reaction which leads to color also produces acrylamide. Hopefully high carotenoid potato will not need dextrose to have a golden brown color. An advanced line with non race specific resistanceColumbia Root-Knot nematode derived from NRSP-6 *Solanum bulbocastanum* has gone through all phases of regional yield trials. In commercial trials where nematode control measures and no treatment have been applied this advanced line functions as well without fumigation as with, while Russet Burbank was a total crop failure without fumigation..

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james.busse@ars.usda.gov
PHONE: (608) 890-1394
FAX: 608-262-4743
University of Wisconsin - Dept of Hort
Madison, Wisconsin 53706
4 units shipped in 1 order/s

Haynes, Dr. Kathy
Kathleen.Haynes@ars.usda.gov
PHONE: (301) 504-7405
FAX: 301-504-5555
USDA, ARS
Veg Lab - 10300 Baltimore Avenue
Beltsville, Maryland 20705-2350
50 units shipped in 3 order/s

Jansky, Dr. Shelley
shelley.jansky@ars.usda.gov
PHONE: (608) 262-8324
FAX: 608-262-4743
USDA, ARS
University of Wisconsin - Dept of Hort
Madison, Wisconsin 53706
302 units shipped in 12 order/s

- Germplasm release of five tetraploid cold chipping clones containing *S. chacoense* and *S. raphanifolium*
- Characterization of clones for potential germplasm release
    - New diploid *S. tuberosum*, *S. raphanifolium*, and *S. chacoense* hybrids with cold chipping resistance after long-term (9 month) storage
    - 4x *S. tuberosum* x *S. infundibuliforme* with russet skin
    - 2x *S. verrucosum* x *S. commersonii* with early and late blight resistance
    - 4x *S. tuberosum* x *S. berthaultii* with red skin and early blight resistance
- New *S. tuberosum* haploid x *S. raphanifolium* hybrids with resistance to early blight
- Early blight resistance in *S. tuberosum* haploid x S. raphanifolium families
    - manuscript accepted for publication
    - no *A. solani* isolated from *S. raphanifolium* and resistant hybrid clones
- Early blight resistance in haploid *S. tuberosum* x *S. berthaultii* families
    - Study completed and being written for publication
- Haploid x *S. chacoense* hybrids with heat stable resistance to PVY
    - Tetraploid offspring generated via 2x x 4x crosses
    - Rr x rr population phenotyped and ready for SNP genotyping
- PVY predictivity study – manuscript accepted for publication
- Scab resistance in haploid x *S. chacoense* F1, F2, and BC families
    - Have been phenotyped in field and greenhouse
    - F2 ready for SNP genotyping

- Tuberization response to photoperiod in *S. tuberosum* hapldoid x *S. microdontum* family
    - Major QTL on chromosome 5
    - Manuscript submitted for publication
- Calcium uptake in tubers of *S. microdontum* x *S. kurtzianum* F2 family
    - Phenotyping has been carried out in 2 replicated greenhouse trials
    - AFLP and SSR genotyping is underway
- Amylose studies
    - Wild species - fine screening, *S. microdontum* accessions
    - Cultivars - Jansky program, NRSP-6, SolCAP
    - Sequencial screening during tuber bulking and storage
- 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

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5 units shipped in 2 order/s

Selection of high phytonutrients.

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13 units shipped in 4 order/s

Use as parents in breeding program. Strong emphasis on late blight resistance derived from Andigena.

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214 units shipped in 4 order/s

See Dr. Spooner's report and list of publications.

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3 units shipped in 1 order/s

**** = INFORMATION NOT PROVIDED BY COOPERATOR