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NRSP-6 TAC 2010 MINUTES --- FINAL 09 09 10

Multi-meeting of NRSP6 TAC, Regional Genebank TACs, Crop Germplasm Committee Chairs, and Plant Germplasm Operations Committee hosted by NE9 Genebank, Geneva, NY.

Ramada Geneva Lakefront, July 27, 2010

Walter DeJong, Chair, NRSP-6 TAC '10
Vice Chair (vacant, since DeJong became Chair upon departure of Isabel Vales)
Creighton Miller, Secretary, NRSP-6 TAC '10

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

ATTENDANCE

Present: Ed Ashworth, John Bamberg, Benoit Bizimungu, Ben Brancel, Peter Bretting, Chuck Brown, Ralph Cavalieri, Harry Danforth, Walter DeJong, Fahrettin Goktepe, Bob Hoopes, Shelley Jansky, Max Martin, Creighton Miller, Jeannie Miller

Absent: David Douches, David Spooner

BUSINESS

Preliminaries

1. There were no announcements
2. There were no changes to the Agenda.
3. Minutes of the 2009 meeting were reviewed. Miller moved to accept, seconded by Hoopes, and minutes were accepted as presented
4. Chair DeJong appointed the Resolutions Committee: Jansky, with input from Brown and Miller

Reports

5. Ben Brancel presented the Lead AA report. Stressed that the genebank is an important asset around the world, and the UW has no plans to abandon it. The genebank is extremely important to Dean Jahn. USDA/ARS Assoc. Area Director Harry Danforth transmitted message from Area Director Chandler that ARS will provide extremely good support for a viable, active, and strong genebank – but we should be open to structural changes if needed. Bamberg mentioned that we do not yet have specifics of ARS's budget commitment to submit in the NRSP6 FY11-15 proposal. There was discussion on use of genebank by UW staff. Thirteen individuals at UW are involved in potato research, so should probably maintain leadership role. Larry Chandler, ARS, committed to help genebank.

6. Ed Ashworth, Regional AA, understands that there are budgetary frustrations. NRSP6 can expect no more than flat support and should plan accordingly. Ben Brancel stated that the vast majority of potato research is in the public sector, and that it would be bad for all resources and administration to come from one place. NRSP6 leadership now needs to make a push to have stakeholders contact their SAESD to urge passage of NSP6 FY11-15 funding.

7. Regional and ARS Technical Reports (complete reports attached)

   Western Region:
   Fahrettin Goktepe reported that 675 units were distributed to the Western Region in 2009. Receiving states were CA, ID, OR, UT, and WA. Material was requested by universities, private companies and individuals. Materials were of good quality and received in good condition. 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. Brown added that private requests are up.

   North Central Region:
   David Douches was not present, but sent report (attached).

   North East Region:
   Walter DeJong noted that there were 20 orders – 121 units. These went to large universities and some small farms in NY and surrounding area. Largest order was from Keith Perry, entomologist.

   Southern Region:
   Creighton Miller reported 29 orders (increase from 2008) and 422 accessions, with Texas A&M the largest user. Texas is currently using *Solanum jamesii* in human prostate cancer studies. Craig Yencho is working on heat necrosis and Colorado Potato Beetle. He also stated that TAMU has already suffered a 5% cut in funding, with another 10% cut possible. Miller has been ½ time for three years. 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. The TX legislature has provided $800,000 for two years to study of ZC. New Zealand hard hit by ZC. Research should focus on the vector. There might be tolerance to ZC, but probably not resistance.

   ARS:

   Chuck Brown reported there were 17 users of 1, 452 units

   - David Spooner has been prolific in publication area - Investigating the species boundaries and phylogenetic relationships of wild and cultivated potatoes

- Shelley Jansky has been working on PVY resistance, amylose content in starch, early blight resistance, invertase activity, bridge crossing, processing qualities, soft rot resistance (*S. chacoense*)

    - Diego Fajardo and Shelley Jansky have determined amylose content in tuber samples from 94 wild *Solanum* accessions representing 38 species. Species selected for high amylose percentage were: *S. acaule, S. commersonii, and S. raphanifolium* while *S berthaultii, S. lignicaule, and S. morelliforme* were selected for low tuber amylose content. Further screenings will be conducted to determine intra- and inter-accession variability. Fine screening of *S. microdontum* accessions and an initial screen of 187 clones from the Sol CAP core collection were also performed.
- Dennis Halterman investigating natural diversity in wild species and effector proteins related to late blight
- Rich Novy concentrating on late blight resistance
- Prosser, WA – phenolics in cultivated and wild species, health factors in potato, early (baby) potatoes, high nutrients
  Ozette potato from NW Washington (Macaw Indians) possible freeze resistance
  Brown is working on high carotenoids, black dot resistance.
- Potato cyst nematode was found in Iowa in 2006

Agriculture and Agrifood Canada -- (actually presented at 1:00)

Benoit Bizimungu reported 9 orders (159 clones) from genebank. AAFC is the main user, with major focus on incorporation of genetic resistance to late blight, PVY, PLRV, *Verticillium* wilt and CPB. They have a Potato Gene Resources Collection (159 clones), including Canadian-bred varieties, heritage cultivars, and selected breeding parents. They have released four cultivars and five related publications.

Discussion – Frito Lay has 300 clones in storage. There was further discussion on preservation of historical collection of American cultivars. This is a function of the genebank, but can't keep all – perhaps seed storage lab in CO? Should get input from breeders then pick 20 varieties that should be maintained. Each breeder to send in three suggestions and state why each is worthy of review/viable argument as to why important and send to Martin. Martin has a large set of clones. Tech reps will review what we have and make suggestions for eliminating and adding. Breeders are responsible for supplying clean material to the genebank.

8. **Industry Perspective**

Bob Hoopes stated that Frito-Lay has a history of using NRSP-6 germplasm. Past orders of 440 & 438 good – now 482. Have used at least 20 wild species. Dan Ronis can provide details of number received. Wild species used for health and wellness studies and Corinne for PVY resistance. There has been extensive use of Sturgeon Bay germplasm over the years. FL will provide a list of public materials.

9. **NRSP-6 Report** – Bamberg (Annual Report, CY09 to date attached)

Reports, administrative structure and new personnel can be found on NRSP-6 website. Report is structured by genebank mission area.

- Acquisition: Collecting in US to stock genebank and R&D type work. Pursuing more efficient collection and multiplication practices. Lists papers published. Examines diversity – amazing potential of germplasm to provide useful traits.
- Collections: Need to look at what is available in other genebanks as related to late blight resistance. Ordered 17 primitive cultivars from CIP – grown in Prosser or Aberdeen. Krantz has been acquired from Christian Thill – has lots of wild germplasm in pedigree.
- Preservation: Have about 4,500 seed (200/year for 20-year cycle). Involves disease and viability monitoring. Some species are selfing.

Investigating bee pollinatinations in caged field plots to avoid hand pollinating labor. Eliminated backlog of andigena accessions by field OP increases. Eliminated quarantine backlog. Growing and preparing tuber samples for multiple uses with help of Kemin company, whose interest is in appetite suppressant extract. Similarly looking at all *microdontum* populations in the collection at once for multiple trait screening, links between traits, links with ecogeo parameters and effectiveness of core collection based on adaptive DNA markers. About 70 phu-stn populations received long ago from Frank Haynes' recurrent daylength adaptation selection program have been planted to assess tuberization.

Martin stated that virus testing of some in vitro stocks had not been done for several years, so testing has been conducted at UW. Repeated that always looking for more efficient ways to do things and make the genebank more useful.

Distributions for CY2009 were typical.

Impact statement was edited to stress health benefits and economic impact of potato

Status of Renewal, Funding, etc.: NRSP-6 FY11-15 was submitted last September and received 58 out of a possible 60 "excellent" scores by the

external review panel in January. Bamberg answered the set of 5 questions from the NRSP Review Committee in late Feb, but in June a reply was received saying this was not sufficient. Bamberg provided germplasm-impact documentation based on SAES staff publications, but Cavalieri requests additional SAES user data showing how the genebank is helping universities. Also need to stress UW's in-kind contributions. The RC will have a conference call in August to vote on recommendation of NRSP6 FY11-15 to the whole body directors meeting in September.

David Spooner was absent, but Bamberg transmitted report that Spooner continues to pursue research in areas reported last year.

Walter DeJong comments on AFRI Climate Change grants:
This year the focus is on cereals, next year legumes / forages, and in 2012, Horticultural crops can apply. We should organize for a stress resistant potato proposal. Avoiding disease pressure in tropical or sub-tropical environments may depend on early bulking.

10. **NPL report**: Peter Bretting discussed the 2010 Office of National Programs Report, and personnel changes. ARS FY2011 President's NPGS Budget Proposal includes a proposal for a budget increase of $3.65 M—very positive in light of recession, two wars and BP oil spill. NPGCC was created in 2005 to coordinate government partners in germplasm. Despite budget challenges, states value NPGS so much that they continue OTT funding at regional and national level. SAES scientists are the single largest user category of germplasm (this discussion took place in morning session).

    The US Senate is currently considering for advice and consent to ratification the FAO International Treaty on Plant Genetic Resources for Food and Agriculture. Central and South America are closed to collecting-- best opportunities are with former Soviet Union countries for collecting.

    Cavalieri, NRSP Review Committee Chair from WSU gave further advice on submitting NRSP6 project renewal for FY11-15: NRSPs are to help support research by experiment station faculty. There is pressure on budgets, so project funding is competitive. While there is strong support for regional genebanks, there is some question as to why there should be a national NRSP potato genebank. Some don't want to use Hatch funds for this purpose. Bamberg explained that OTT national support for the NRSP6 genebank represents the exception that makes sense, since each of the four regional genebanks certainly have a national scope.

    Cavalieri notes that at WSU it is illegal to allow a private company to profit from our publicly funded research, so focus must be on how NRSP6 benefits SAES. But the western states will be supportive of NRSP6. Universities have

to supplement by seeking extramural funding, so expect the same of NRSP6. Directors feel NRSP6 should have a way to recoup value extended to industry.

Coordinating activities is valuable – at NRSP-6 annual meeting ideas are exchanged, breeders get input into what the genebank does.

We need to get information to the Directors so they will pass NRSP6 funding at their fall meeting. Personnel changes in NRSP Review Committee have made the process difficult. FY11-15 proposal needs to have additional documentation of service to SAES. Then approval by NRSP Review Committee should not be a problem.

13. **NIFA Report** -- Ann Marie Thro
    - ARS budget up – Hatch funds level
    - Reads and summarizes all reports – non-technical aspects and impact get lots of readership
    - Have been changes in REPORT system. White House has decided that one format is needed for all reports.
    - Would like to document long-term impacts – scientists should flag high value items
    - Characterization funds will be available in a few years
    - Food Security is somewhat funded by USDA & USAID – they can now communicate
    - There is a frank emphasis on productivity – feed the future is the #1 government priority
    - Focus on African countries first. Country-based investment plans to be used – Bangladesh, Haiti, Rwanda, Ghana, etc.
    - $40,000,000 reduction and $50,000,000 increase. NIFA budget up 1%. Should cite funding source on publications – Hatch and NPGS
    - NEPA – include this information to speed up grants
    - Have CRIS reports impact statements ready to go when asked for.
    - Very important to give source of funding credit for everything we publish

11. **APHIS/Quarantine report** -- Jorge Abad
    - Can request for anyone that is a legal resident of the US
    - More interest in exotic varieties from abroad
    - Have collection for 1992 – when tested, found one infected with virus – also new virus on stuff from S. America
    - Multiplex testing to identify new viruses is available but is $3,000/sample
    - 75 accessions/year
    - TPS received 22 but only 13 germinated
    - Backlog of Spooner collections have now been processed
    - How to handle requests from small growers

- One downside of charging for legitimate import process is that some may avoid paying by smuggling germplasm into the country.

15. **Resolutions**:

    WHEREAS, Dr. Isabel Vales served as the Western Regional Advisor to the NRSP-6 Potato Germplasm Project; therefore, be it

    RESOLVED, that the NRSP-6 Technical Advisory Committee expresses its appreciation for Dr. Vales' leadership and wishes her success in future endeavors.

    WHEREAS, the NRSP-6 Technical Advisory Committee met at the Ramada Geneva Lakefront hotel in Geneva, NY, on July 27, 2010; 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 the Geneva NE9 genebank staff for coordinating the multi-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.

16. Elect new officers and set next meeting location

    Officers

Chair:	Walter DeJong
Vice-Chair:	Creighton Miller
Secretary:	Fahrettin Goktepe

    Next Meeting Venue = Sturgeon Bay

Respectfully Submitted,

Jeannie P. Miller
For Creighton Miller

NRSP-6 Technical Committee Meeting Agenda

Geneva, NY / July 27-28, 2010

... as part of the joint TAC, CGC Chairs and PGOC meeting
http://www.ars.usda.gov/News/docs.htm?docid=19195

July 26th: Travel, arrive Ramada Geneva Lakefront (see footer), registration 6-8 PM
July 27th: NRSP6 TAC business meeting **8:00**-5:00, Banquet 6:30-9:00 PM
July 28th: Joint PGOC, CGC Chairs, and RTAC Meeting , tours and/or departures in PM

BUSINESS

Preliminaries

1. Welcome, introductions, misc. announcements, distribution of documents
2. Approve, add to, schedule and prioritize agenda items
3. Review of 2009 minutes
4. Chair DeJong appoints Resolutions Committee

Reports

5. Lead AA
6. Other regional AAs
7. *Regional and ARS Tech Reps
8. Agriculture and Agrifood Canada (Bizimungu)
9. Industry perspectives
10. NRSP6 report (Bamberg & Martin)
    -- *Review Annual Report 2009
    -- *FY11-15 proposed MRF: funding and staffing-- outlook and strategy
11 Collecting and taxonomy
12. USDA, ARS admin (Bretting)
13. CSREES (Thro)
14. *APHIS/Quarantine (Abad)
15. *Resolutions
16 *Elect new officers and set next meeting venue

* with documents for minutes and/or needing action/approval

ANNUAL REPORT

CY 2009 with Jan-May 2010 updates as noted

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	Secretary (2010)	J. C. Miller, Jr.
Western Region		F. Goktepe
North Central Region		D. Douches
Northeastern Region	Chairman (2010)	W. De Jong
Administrative Advisors		
Southern Region		C. Nessler
Western Region		L. Curtis
North Central Region	Lead AA	M. Jahn
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
Cooperative States Research Education & Extension Service	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 the Santa Catalinas in SE Arizona in late September (supported with extramural funding from USDA), sampling 15 new *fendleri* sites (report available on request). That expedition was prompted by research which identified the area as particularly rich in unique AFLP alleles, and a follow-up marker study was initiated to confirm. Bamberg and family also re-collected *fendleri* which did not establish in the genebank from the 2008 expedition to the Pinalenos and searched (unsuccessfully) two reported *jamesii* sites in the Dragoons and San Pedro river banks near Sierra Vista, respectively, and made one new collection of *fendleri* on the Barfoot Lookout trail in the Chiricahuas. One new *fendleri* population was received as a donation from the Guadalupe mountains, Texas, and a study was initiated to compare this and new (2007) Guadalupe collections to existing genebank samples from the closest sites. Preliminary plans and collecting permits were obtained for the Santa Rita mountains of SE Arizona for 2010. Tuberization and clustering of plants by phenotype was assessed for USA *fendleri* versus LON from Mexico.

Five papers were published in 2009 and through June 2010 using stocks collected by genebank staff in the USA, on these themes: anti-cancer proliferation factors, extreme tuber dormancy and very low tuber pH in *jamesii*, comparison of genetics from "easy" versus "remote" collecting sites, comparison of genetics from collecting tubers versus seeds (see publications section).

Five new acquisitions were from S. Kiru's VIR (Russia) late blight breeding program, 21 Arizona collections by Bamberg and associates, 2 monoploid clones of R. Veilleux sequencing standards, 17 primitive cultivars from CIP (Peru), the US cultivar Krantz from C. Thill, and one complex seedlot from E. Leue of PanAmerican Plant Research carrying the topiary mutant which had been lost from its original *infundibuliforme* population in the genebank.

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 2009, informing them of new stocks of true seed, tubers, in vitro plantlets, or herbarium samples.

B. Preservation and Evaluation

We increased 238 wild seed populations, performed 700 PSTVd tests, 1003 germination tests, 20 ploidy determinations, and 25 tetrazolium seed viability tests. Cultivated species can be difficult to seed increase under screen or glass, so a backlog had developed. Over 8 seasons we have removed most of that backlog by growing over 800 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.

Multiplex testing projects: We are attempting to organize more efficient screening by designing multiple uses for a single array of samples. Thus, some 400 cultivated stocks will generate field tubers over the 2009 and 2010 seasons for testing the appetite suppressant PI2 (Kemin Co.), starch type (Jansky), folate and thiamine (Goyer), antioxidants and tomatine for anti-cancer (Navarre), potassium (CIP, Lozoya), pH (Bamberg), calcium (Palta). We do not necessarily have a plan or funding for evaluating all traits for all items, but to the extent that samples are stable, they will provide an available resource into the future. On the wild side, we have been generating replicate sets of tubers of all genebank *microdontum* for several years, and have been pursuing evaluation data on traits for which mcd excels, such as low pH, high calcium, soft rot and late blight resistance, high protein and antioxidants. The multiplex approach allows detection of links between these traits. And, since these wild mcd accessions are linked to a known ecogeographic data, associations between traits and origin environment can also be detected. DNA markers will also be generated to detect associations of these characteristics with genetics. A grant was submitted to NSF to support this.

For this *microdontum* project, we also investigated, for the first time, variation for tuber greening, and found what appear to be wide and repeatable differences. We are re-growing tubers of selected genotypes to see if resistance to greening will carry over to the next tuber generation.

In cooperation with CIP (Tay et al.), UW (Palta), and Peruvian native highland farmers we made frost hardy hybrids here and tested them on location in Peru. The same cooperators continued testing of calcium uptake and yield benefit (striking in some cases) for native cultivars tested on location in Peru.

When we assessed red skinned *tuberosum* breeding stocks selected for differences in pH, no clear association of skin brightness after boiling or steaming could be detected. This needs to be repeated with more individuals segregating to wider extremes of pH.

We continued testing spontaneous field seed increases of selfing species under floating bee-proof mesh.

S. phureja/stenotomum is a cultivated species with known potential for several useful traits. About 70 populations recurrently-selected many years ago by Frank Haynes are being field grown to test tuberization compared to unselected versions of these species from the genebank.

We pursued a better understanding of gibberellin genetics. Diploid dwarfs were observed to produce shoots revertant to normal phenotype much more frequently than tetraploid dwarfs. Testcross seed was made on five revertant diploids and one revertant tetraploid. Dwarf progeny proportion from a selfed revertant tetraploid suggests that it became simplex. Testcross seed was also generated on three Russet Norkotah sports (obtained from J.C. Miller) to test the idea that such sports similarly represent somatic conversion of a recessive *ga1* to the dominant allele.

We tested variations for several techniques: TDZ for flowering and fruitset, oryzalin for chromosome condensing and ploidy doubling, media and gels for rooting cuttings, increased light intensity for seedling germination and performance.

We conducted a literature search on AGEs to assess potential of investigation of potato germplasm impact on risk of diabetes.

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

C. Classification

Dr. Spooner et al. have published and are working on five different areas of potato research: 1) molecular markers for genebank studies, 2) cultivated potato origins, 3) relationships in wild tomatoes and potatoes, 4) the predictive power of taxonomy relative to disease resistance data, and 5) a linkage map for late blight resistance in wild potatoes.

D. Distribution

The volume and types of stocks sent to various consignee categories are summarized in the table below. NRSP-6 distributed 191 orders to clients in 33 states of the USA and 26 orders to 11 other countries.

	Units of Germplasm Sent[1]								
Category	Seed	TU	TC	IV	DNA	Plants	Herb	Total	PIs
Domestic	1,573	1,159	1,766	308	206	0	0	5,012	3,297
Foreign	8,203	0	22	151	0	0	0	8,376	1,357
Total	9,776	1,159	1,788	459	206	0	0	13,388	4,429

[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 2009 Potato Assn of America meeting and NCCC84 Potato Genetics Technical Committee meeting in December 2009. Bamberg presented genebank research and outreach at the NPC Expo in Orlando in January, 2010 and pitched the genebank program to NCR directors at their 2009 spring meeting in Kansas City. del Rio presented genebank research at the 15th Triennial Symposium of the International Society of Tropical Root Crops in Cusco, Peru, in 2009 and Bamberg gave an invited presentation on the genebank research at the 2010 meeting of the Latin American Potato Association in Cusco. An agenda brief on NRSP-6 progress was sent to all regional association spring meetings.

Visitors: The genebank hosted the annual national meeting of NPGS curators (PGOC) and NRSP-6 TAC meetings in July 2009. 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 2009

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. 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. 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 we prepared test samples and arranged funds and cooperators for screening for high potassium germplasm. The total cost of these three diseases each year is about 100 times that of the total annual farmgate value of the potato crop, so we conclude that the prospect of making a significant impact through nutrition compares favorably with using germplasm to increase yield or reduce production costs. With R. Navarre, we also identified a *phureja* clone with extremely high antioxidants, well-known for their health-promoting effects. See also the NRSP-6 website for a comprehensive impact statement for the genebank.

5. WORK PLANS / STAFF & FUNDING / ADMINISTRATION

We wrote a project report (FY06-10) plus renewal (FY11-15) proposal for $150K funding which received 58 of 60 possible "excellent" scores in external review. At the same time, the final step of UW salary withdrawal occurred, a deficit of 80% FTE in the Gardener position and 40% FTE in the Project Assistant position. Longtime Gardener C. Fernandez retired at the end of CY09 but was rehired as a half-time temp in early CY10 as a stopgap measure made possible by a promise from ARS of additional funding. We argue the need to fund, at minimum, all of the current genebank staff, including a *fulltime* ARS Gardener position, plus sufficient support for supplies, equipment, and ad hoc labor to maintain a service institute with a national and international scope. For this we need approval of NRSP-6 for FY11-15 at the requested funding level.

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.

Health will increasingly motivate the consumer, so improving nutritional factors of potato has become a priority research activity. The payoff is less human suffering, less healthcare costs, and more demand, market share, and profitability for potatoes.

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.

Grants: A USAid Grant was approved to initiate cooperation between CIP and Wisconsin in the next two years for frost and calcium studies. Proposed: Using *Solanum microdontum* as a model for a genomic marker-assisted potato germplasm organization and management (NSF-in review). U.S. Peru Planning Workshop - Current advances in technologies and methodologies to assist conservation, evaluation and use of plant biodiversity with emphasis in potato diversity (NSF-rejected). The effect of calcium treatments on abiotic stresses (frost and heat tolerance) on native and wild potatoes, and the evaluation of CIP potato accessions in response to calcium treatment and abiotic stress tolerance (USAid – in review). Two SCRI proposals, one on antioxidants, another on Proteinase Inhibitor 2 (both rejected).

6. PUBLICATIONS ISSUED DURING THE YEAR 2009

A. Publications issued by NRSP-6 Personnel

Bamberg, J.B. and A.H. del Rio. 2009. Unbalanced bulk of parents' seed does not cause significant drift in germplasm regeneration of two model potato (*Solanum*) species populations. Am J Potato Res 86:391-397.

Bamberg, J.B. and A.H. del Rio. 2009. Selfing potato species produce robust spontaneous field seed increases under floating mesh. 93rd Annual Meeting of The PAA, Fredericton, New Brunswick, Canada, August 9-13, 2009, p 74. (Poster)

Bamberg, J.B., A.H. del Rio and Rocio Moreyra. 2009. Genetic consequences of clonal versus seed sampling in model populations of two wild potato species indigenous to the USA. Am J Potato Res 86:367-372.

Del Rio, A.H. and J.B. Bamberg. 2009. Impact of seedling transplant selection on the genetic diversity of genebank populations of outcrossing potato species. 93rd Annual Meeting of The PAA, Fredericton, New Brunswick, Canada, August 9-13, 2009, pp 41-42. (Abstract)

Ghislain, M., J. Nunez, M. del Rosario Herrera, J. Pignataro, F. Guzman, and D.M. Spooner. 2009. Robust and highly informative microsatellite-based genetic identity kit for potato. Molec Breed 23:377-388.

Ghislain, M., J. Nunez, M. del Rosario Herrera, and D.M. Spooner. 2009. The single Andigenum origin of Neo-Tuberosum materials is not supported my microsatellite and plastid marker analyses. Theor Appl Genet 118:963-969.

Jansky, S.H., J. Liping, X. Kaiyun, C. Xie, and D.M. Spooner. 2009. Potato production and breeding in China. Potato Res 52:57-65.

Jansky, S.H., R. Simon and D.M. Spooner. 2009. A test of taxonomic predictivity: Resistance to the Colorado potato beetle in wild relatives of cultivated potato. J Econ Entomol 102:422-431.

Nzaramba, M. Ndambe, Lavanya Reddivari, John Bamberg, and J. Creighton Miller, Jr. 2009. Antiproliferative activity and cytotoxicity of *Solanum jamesii* tuber extracts on human colon and prostate cancer cells in vitro. J. Agric Food Chem 57:8308-8315.

Nzaramba, M. Ndambe, Lavanya Reddivari, John Bamberg, and J. Creighton Miller, Jr. 2009.
Phenolic and glycoalkaloid levels of *S. jamesii* accessions and their antiproliferative effect on human prostate and colon cancer in vitro. Am J Potato Res 86:154. (Abstract)

Rodriguez, F. and D.M. Spooner. 2009. Nitrate reductase phylogeny of potato (*Solanum* sect. *Petota*) genomes with emphasis on the origins of the polyploid species. Syst Bot 34:207-219.

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2009 NRSP-6 Germplasm Utilization Report from the North Central Region

Compiled and Submitted by
David S. Douches, NC representative

University of Wisconsin
Felix Navarro and Jiwan Palta

Our ongoing strategies include the use of lines derived from the crosses made with several wild species 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, W2133-1, W2310-3) 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 Shelley 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*.

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 –5ºC. New lines are being developed using these good tuber type and *S. andigena* to select for better performance under Peruvian Highlands.

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 *ambosinum, cajamarquense, chiquidenum, chomatophilum, dolichocremastrum, hypacrarthrum, limbaniense, medians, tarapatanum, urubambae.*

Michigan State University
David Douches

In 2009r we obtained accessions from the genebank for ornamental purposes. The MSU Horticulture Gardens is looking for something different. Max Martin supplied us with some species with ornamental qualities that we did a test grow out to evaluate. No selections were kept for further study

We have been working closely with Shelley Jansky and in the past we worked with Bob Hanneman. These scientists have been making crosses to introgress germplasm for insect and disease resistance. This past year we evaluated selections in the Colorado potato beetle nursery and identified selections with some field resistance. In 2009 we made some crosses and those progeny were grown to produce tuber families for 2010 field planting and evaluation. These populations are in the field for 2010 fall selection. We are also evaluating a set of species accessions for Colorado potato beetle resistance in cage studies. These accessions were started from TPS. We are also planning to evaluate the volatiles given off by these plants with the new vegetable entomologist, Zsofia Szendrei.

In 2009 summer and fall we conducted field studies to evaluate a series of *S. microdontum* selections for foliar and tuber late blight resistance. Foliar and tuber resistance to late blight was identified in various accessions. This was in collaboration with John Bamberg. A final report was submitted June 2010.

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 *Solanum microdontum*. 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. Plants will be evaluated this summer of 2010.

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wang.974@osu.edu
PHONE: (614) 292-2116
FAX: *****
11 units shipped in 2 order/s

Ohio State University
207 Righmire Hall
Columbus, Ohio 43210

Witherell, Andy
raw@plantpath.wisc.edu
PHONE: (608) 263-8765
FAX: 608-262-7871
11 units shipped in 3 order/s

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

Wood, Carmala
catalinagrey@hotmail.com
PHONE: (320) 235-0621
FAX: *****
6 units shipped in 1 order/s

Foxglove Farm
1305 17th St. SW
Willmar, Minnesota 56201

Woods, David
webmaster@psrseed.com
PHONE: (218) 760-5842
FAX: *****
22 units shipped in 2 order/s

39229 N Clitherall Lake Rd
Battle Lake, Minnesota 56515

York, Paula
paulayork1101@gmail.com
PHONE: (812) 292-0661
FAX: *****
7617 S ST RD 62
Lexington, Indiana 47138
1 units shipped in 1 order/s

**** = INFORMATION NOT PROVIDED BY COOPERATOR

NORTHEAST REGION Report to NRSP-6 Technical Committee, July 2010

Northeast Region Representative: Walter De Jong

The Northeast region received 180 units of germplasm, spread across 26 requests, in 2009.

Of the most interest:

Fifteen of the requests were from small farms and seed-saver organizations, a dramatic increase over years past (when just a few requests per year were typical). This is a direct response to a concerted effort by Dr Keith Perry of the Cornell Uihlein Farm in Lake Placid, NY over the past five years to evaluate, and then distribute, clean seed of heirloom and unusual varieties to organic and other small-scale growers in the region. The Uihlein farm requested an additional 50 units for evaluation in 2009.

Dr Zach Lippman, a tomato developmental geneticist at Cold Spring Harbor Laboratory, requested 19 units to begin to look at how potato compares to tomato for vegetative to reproductive phase change. One of his longer term interests is to see how the potato meristem that creates tubers develops, and how flowering affects that process. He considers the potato genebank to be extremely valuable, especially as he and his collaborators venture beyond tomato into the developmental transitions that define other Solanaceae species.

Potato breeders Dr Greg Porter (Univ Maine) and Dr Walter De Jong (Cornell) requested 9 and 6 units, respectively, to introduce new disease resistance (blight, virus resistance) and quality traits (flesh color and tuber shape) into their breeding programs.

Southern Region Report to NRSP-6 Technical Committee

J. Creighton Miller, Jr.

July 27, 2010

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.

Tweny-nine Southern Region orders were filled, including 422 accessions.

2009 SOUTHERN REGION ORDERS

Allen, Deborah seasonschanging@aol.com PHONE: (352) 379-7740 FAX: ***** 2 units shipped in 1 order/s	Deseret 4H 3231 SW 35th Blvd Gainesville, Florida 32609
Allen, William bill_allen40@yahoo.com PHONE: (850) 838-9006 FAX: ***** 3 units shipped in 1 order/s	Sugar Sand Farms 4689 Strickland Landing Blvd. Perry, Florida 32348
Ballesteros, AJ a_ballesteros@sbcglobal.net PHONE: (210) 401-0956 FAX: ***** 1 units shipped in 1 order/s	ajin956 1415 Marigold Avenue McAllen, Texas 78501
Bourgeois, Blane iconoclast_psychoacoustics@yahoo.com PHONE: (870) 895-3174 FAX: ***** 66 units shipped in 2 order/s	The Rare Vegetable Seed Consortium Ethnobotanical Research Institute Salem, Arkansas 72576

Clough, Mark E.
mark_clough@ncsu.edu
PHONE: (252) 793-4428
FAX: 252-793-5142
10 units shipped in 2 order/s

NCSU/VGJREC
Department of Horticultural Science
Plymouth, North Carolina 27962

Cox, Lisa
lisa@vetteklisa.com
PHONE: (214) 288-8096
FAX: *****
3 units shipped in 1 order/s

Brown-Cox Ranch
4117 Buckwheat Street
Forth Worth, Texas 76137

Dozier, Donna
dozier-munn@sbcglobal.net
PHONE: (918) 245-6226
FAX: *****
1 units shipped in 1 order/s

Square foot Gardening
203 Rawson Road
Sand Springs, Oklahoma 74063

Fogl, Shannon
rabyte79@yahoo.com
PHONE: (919) 639-2024
FAX: *****
1 units shipped in 1 order/s

Fogl's Roost
232 Vuncannon Dr.
Fuquay Varina, North Carolina 27526

Hallada, Heather
buckeye@dnet.net
PHONE: (828) 369-8712
FAX: *****
1 units shipped in 1 order/s

Buckeye Creek Farm
340 Buckeye Branch Road
Franklin North, North Carolina 28734

Harris, Renee
righkem@gmail.com
PHONE: (954) 993-8809
FAX: *****
1 units shipped in 1 order/s

2110 NE 42nd Street 2B
Lighthouse Point, Florida 33064

Humphrey, Angelica
ahumphrey04@hotmail.com
PHONE: (910) 723-1294
FAX: *****
1 units shipped in 1 order/s

Humphrey's Hoodlums
134 9th St.
Bolton, North Carolina 28423

Kennard, James
jim@growfood.com
PHONE: (205) 607-6210
FAX: *****
5 units shipped in 1 order/s

Food For Everyone Foundation
4348 Spring Brook Lane
Gardendale, Alabama 35071

Knight, Lynn
lynnjonesknight@hotmail.com
PHONE: (334) 258-4059
FAX: *****
17 units shipped in 2 order/s

Knight Farm
261 N. Washington Street
Slocomb, Alabama 36375

Mancuso, William
barnibus27@gmail.com
PHONE: (850)722-6467
FAX: *****
1 units shipped in 1 order/s

10732 Las Vegas St.
Youngstown, Florida 32466

Marlar, Kathy
katrjackson@hotmail.com
PHONE: (580) 362-3767
FAX: *****
1 units shipped in 1 order/s

Sandy Soil Farm
8850 E Hilltop Road
Newkirk, Oklahoma 74647

Miron, Stephen
stevenmiron23@yahoo.com
PHONE: (828) 572-1217
FAX: *****
3 units shipped in 1 order/s

Miron Family Farm
4609 Thad Miller
Lenoir, North Carolina 28645

Napolitano, Jesse
jnap31@hotmail.com
PHONE: (479) 643-2124
FAX: *****
1 units shipped in 1 order/s

Brannon Mtn Farm
1126 Hwy 295
Elkins, Arkansas 72727

Ndambe, Nzaramba M.
*****
PHONE: (979) 845-0135
FAX: *****
178 units shipped in 1 order/s

Texas A&M University
Department of Horticultural Sciences
College Station, Texas 77843-2133

Pilon, Roger
visa.mundo@gmail.com
PHONE: (506) 219-8479
FAX: *****

Ponics Organization
#SJO 20400
Doral, Florida 33122-5331

6 units shipped in 1 order/s

Price, Jeff
jkheritagefarms@msn.com
PHONE: (256) 974-3719
FAX: *****

JK Heritage Farms, LLC
6545 County Road 59
Moulton, Alabama 35650

83 units shipped in 2 order/s

Puentes, Joseph
makas@nc.rr.com
PHONE: *****
FAX: *****

13110 Meadow Ridge Drive
Rougemont, North Carolina 27572

14 units shipped in 2 order/s

Puerta, Maria Virginia S.
mvsanchezprerta@fca.uncu.edu.ar
PHONE: 542614135000
FAX: *****

1021 Arlington Blvd.
Arlington, Virginia 22209-2245

4 units shipped in 1 order/s

Rose, Kimberly
kimnkell@yahoo.com
PHONE: (606) 668-6986
FAX: *****

Rose Mountain Farms
425 Service Road
Campton, Kentucky 41301

2 units shipped in 1 order/s

Srofe, Heather
rametteperegrine@aol.com
PHONE: (407) 532-9479
FAX: *****

Home School
6419 Stardust Lane
Orlando, Florida 32818

5 units shipped in 1 order/s

Stewart, Barbara
always_3xa_lady@yahoo.com
PHONE: (843) 818-2290
FAX: *****

Mini Farm
93 Briarwood Circle
Goose Creek, South Carolina 29445

1 units shipped in 1 order/s

Stroman, Carla carlystroman@yahoo.com PHONE: (863) 229-8023 FAX: ***** 1 units shipped in 1 order/s	330 Winter Ridge Blvd. Winter Haven, Florida 33881-5803
Taylor, Mary jtmtfl@embarqmail.com PHONE: (352) 564-0337 FAX: ***** 5 units shipped in 1 order/s	Shares 10260 W. Ohio Dr. Crystal River, Florida 34428
Tix, Leslie leslie_ann_001@yahoo.com PHONE: (352) 583-8249 FAX: ***** 1 units shipped in 1 order/s	TLC Farm 35180 Soap Stone St. Webster, Florida 33597
Walker, Clarence W. clarencewwalker@bellsouth.net PHONE: (770) 606-0459 FAX: ***** 4 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 2009, 56,501 first-year seedlings representing 386 families were grown, and 279 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 2010. Plant Variety Protection has been granted for Stampede Russet and is pending for Rio Rojo (NDTX4304-1R). A major effort

continued in 2009 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

Previously, we screened a number of accessions of wild potato germplasm from the US Potato Genebank for antioxidant activity (AOA), total phenolics (TP), and total glycoalkaloids (TGA). Based on the results of the screening, it was determined that neither AOA or TP are significantly correlated with TGA in the wild accessions, and that the use of wild accessions in a breeding program for high AOA and TP should not result in a higher level of glycoalkaloids in resulting varieties.

Current studies are investigating the antiproliferative properties of selected potato accessions on PC-3 prostate cancer cells. The antiproliferative activity of phenolic extracts from *Solanum kurtzianum* was studied in PC-3 prostate cancer cell culture and advanced to an *in vivo* mouse model to study bioavailability interactions. PC-3 prostate cancer cells were injected into the dorsal flanks of mice to induce tumor development. Following the development of palpable tumors, mice were treated with 1mg of potato extract every other day. However, the glycoalkaloids in the extract from *S. kurtzianum* material had a toxic effect on the mice; therefore, the impact of the bioactive compounds in *S. kurtzianum* on tumor development was not determined. Future *in vivo* studies will focus on *Solanum bulbocastanum,* which represents a viable substitute for *S. kurtzianum* because it has a lower amount of total glycoalkaloids (TGA), but comparable levels of total phenolics (TP) and antioxidant activity (AOA). 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".

Nzaramba, M.N., L. Reddivari, J.B. Bamberg, and J.C. Miller, Jr. 2009. Antiproliferative activity and cytoxicity of *Solanum jamesii* tuber extracts on human colon and prostrate cancer cells *in Vitro*. J. Agric. Food Chem. 57:8308-8315.

Virginia – Richard Veilleux

Variety trials were conducted by Josh Freeman at the Eastern Shore Agricultural Research and Extension Center in Painter, Virginia. The Potato Genome Sequencing Consortium has nearly completed sequencing and annotating the genome of a doubled monoploid clone (DM 1-3 516 R44) developed in Blacksburg that will serve as the draft potato genome. The progeny of transposon tagged lines of the corresponding monoploid that gave rise to the sequenced doubled monoploid have been screened for transposition resulting in approx. 20 transposants. Allelic diversity of three genes controlling potato glycoalkaloid production has been determined in a diploid population of *S. chacoense* and *S. phureja*.

Clough ME, Yencho GC, Christ B, DeJong W, Halseth D, Haynes K, Henninger M, Hutchinson C, Kleinhenz M, Porter GA, Veilleux RE (2010) An interactive online

database for potato varieties evaluated in the eastern United States. HortTechnology 20: 250-256
Gao YX, Zitter TA, Veilleux RE (2009) Verticillium wilt in solanaceous crops. Plant Breeding Reviews 33: 115-144

Ginzberg I, Tokuhisa JG, Veilleux RE (2009) Potato steroidal glycoalkaloids: Biosynthesis and genetic manipulation. Potato Research 52: 1-15

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. We are 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.

Breeding and Variety Development - The bulk of our breeding work is conducted at the Tidewater Research Station (NCDA&CS)/Vernon G. James Research and Extension Center (NCSU) in Plymouth, NC. We also conduct 4-5 on-farm trials each year as part of our variety development efforts. Crossing work is done at our greenhouses in Plymouth, and we grow and share mini-tubers with the USDA-ARS yearly, and with Cornell and Maine as materials are available. In 2009, we planted 20,106 single-hills, the most that we have ever planted in the program. We selected 806 clones (4.0%) from these materials. From the 627 clones planted in our 2nd yr. 6-hill plots, 69 (11%) were selected for future evaluation. From the 67 clones planted in our 3rd yr. 20-hill plots 15 (22%) were selected for further evaluation, while in our 4th yr. 60-hill plots, 2 (22%) of 9 were selected. A similar amount of materials was planted in 2010.

Yield trials are conducted on-farm and/or at the TRS/VGJREC. We try to evaluate advanced clones and newly released varieties at more than one site in NC each year, but funding reductions have begun to severely limit these efforts.

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 - 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. **Error! Reference source not found.** 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).

Our Colorado potato beetle (CPB) germplasm enhancement project seeks to introgress CPB resistance derived from *Solanum berthaultii* and *S. chacoense* into cultivated potato. The project began in 1998 using materials obtained from the USDA-ARS Potato Genebank, the USDA-ARS BARC, and Cornell University. We screen lines for resistance and adaptation using a rapid advance strategy that consists of simultaneous selection for CPB resistance and adaptation using separate plots planted the same year.

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. 2009. Genetic, Genomic, and Transgenic Approaches to Understand Internal Heat Necrosis in Potato. Dept. of Horticultural Science. PhD Dissertation. (Co-Chairs, Drs. G. C. Yencho and Dr. B.R. Sosinski.).

McCord, P.H., B. R. Sosinski, K. G. Haynes, M. E. Clough, and G. C. Yencho. 2010. Linkage mapping and QTL analysis of agronomic traits in tetraploid potato (*Solanum tuberosum* subsp. *tuberosum*). Crop Science. (accepted).

McCord, P.H., B. R. Sosinski, K. G. Haynes, M. E. Clough, and G. C. Yencho. 2010. QTL mapping of internal heat necrosis (IHN) in tetraploid potato. TAG (submitted).

Yencho, G.C. and M.E. Clough. 2009. North Carolina Potato Variety Trial and Breeding Report, 2009. NC State University, Raleigh, NC. 48 pp. < http://potatoes.ncsu.edu/Reports.html

Western Region report to the NRSP-6 TAC 2010

Potato Introduction Station
Geneva, NY / July 26-29, 2010

Report of 2009 Western Region orders
Prepared by Fahrettin Goktepe (Western Region Technical Rep.)

During 2009, the Potato Introduction Station (NRSP-6, Sturgeon Bay, WI) supplied potato materials to the following Western states: California, Idaho, Oregon, Utah 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 675 units were distributed to the Western Region. Washington State ordered 301 units (45%), California 98 units (15%), Idaho 80 units (12%), Oregon 72 units (11%) and Utah 23 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, and Thomas Wagner) and individuals. The private sector was very active by requesting almost half of the potato clones distributed to Western Region in 2009: Thomas Wagner requested 251 units, Carol Deppe requested 4units, J.R. Simplot requested 13 units, and Bejo Seeds, Inc. requested 66 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. As expected private sector was relatively more protective and was not as open to share detail information and specific research objectives on which germplasm have been used. 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.

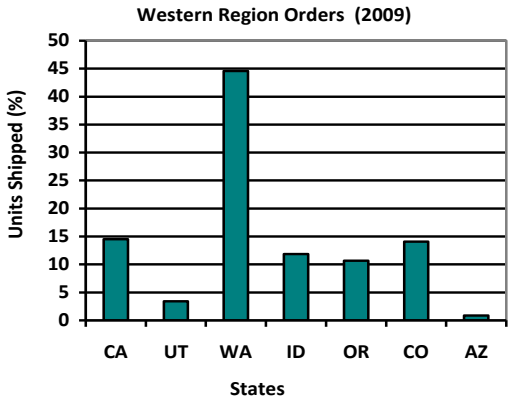

Figure1. The percent unites distributed to Western Region in 2009

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*)
     - Yield and Quality loss
     - 5-15% of CRKN infected tubers at harvest may cause an entire crop to be devalued or rejected for both fresh and processing markets
     - One nematode per 250cm^3 soil at planting can cause crop failure
     - Zero tolerance factors for seed certification and any seed lot, regardless of generation, is automatically disqualified from certification when tubers are infested with CRKN
     - Chemical fumigation can increase the production cost
       "Vydate C-LV" is the most common nematicide being used to control CRKN. The current (2009) retail price of Vydate C-LV is about $ 89/gal and the recommended use rate in the 2.1pints/acre. The management of CRKN by using Vydate C-LV can add to the production costs about $23/acre per application, (could exceed to 20M/year).
     - Source of resistance: $R_{Mc1(blb)}$,derived from the Mexican wild species *S. bulbocastanum*,
   - 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.

Reports and comments from NRSP6 germplasm users:

1) Aymeric Goyer**,** Oregon State University Hermiston Agricultural Research and Extension Center

"I published one paper in which I reported variation in thiamine (vitamin B1) concentrations in tubers of 6 wild species."

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 development of more nutritious potato varieties would *(1)* benefit those for which it is a diet staple, *(2)* help the potato industry cope with negative publicity associated with glycemic index and acrylamide issues, and *(3)* open up new economic opportunities for growers and processors. Thiamine and folate are essential micronutrients in the human diet. These water-soluble B vitamins are great targets for nutritional enhancement of potato because *(1)* thiamine and folate deficiencies are still common throughout the world, even in developed countries, and are responsible of various serious diseases, *(2)* the potato is relatively poor in thiamine and folate compared to rich sources such as beans and lentils, and *(3)* there is little loss of thiamine and folate during cooking and processing. In addition, there is increasing evidence that higher thiamine content correlates with increased resistance to biotic and abiotic stresses in plants. Unfortunately, the natural variation of thiamine and folate concentrations in potato has not been extensively studied. Therefore, the author measured thiamine and folate concentrations in various potato genotypes in order to evaluate the potential for increase of these vitamins in new varieties. Field-grown tubers from commonly grown varieties and advanced breeding lines contained between 410 and 871 ng thiamine per g fresh weight (FW). The higher ones would qualify as good or excellent sources of thiamine. Wild species grown in a greenhouse had even higher variation in thiamine content,

ranging from 476 to 2104 ng per g FW. Primitive cultivars contained between 600 and 1264 ng thiamine per g FW, and had between 159 and 385 ng folate per g FW.

2) Carol Deppe: Vegetable Breeder/Writer Corvallis, OR

"In early spring 2009 I requested two varieties developed by a South Korean company that are supposedly edible raw, having been selected to have less of the digestive enzyme inhibitors that make raw potatoes inedible for non-ruminants. I received these and a couple other varieties from NRSP-6 that came up in the conversation. I basically just want to know whether the varieties actually are edible raw, for either humans or ducks or pigs. Is such a thing possible? I also want to develop new potato varieties, suitable for organic and garden (small scale) food production.

The minitubers produced the small plants such tubers usually produce, and gave us a good batch of bigger tubers each. We haven't tasted them yet. We planted them all to increase the supply before doing serious taste and palatability tests. Check with me again next year. By then we will at least know whether they are palatable raw, though not yet whether they act like food. The quality of the received material was excellent. We got a nice crop of clean seed for the first year's increase."

3) Dr. Caius Rommens, J. R. Simplot Company

"We requested 13 accessions of 5 wild potato species from NPGS6 last year as listed below:
6 *Solanum chacoense* subsp. Chacoense (accession PI 175415, PI 175419, PI 175402, PI 175443, PI 195183, PI 175446)
1 *Solanum demissum (accession* PI 175423)
1 *Solanum etuberosum* (PI 245939)
1 *Solanum phureja* subsp. Phureja (PI 195198)
4 *Solanum stoloniferum* (PI195195, PI 205522, PI 230557, PI 275244)
We received the materials in good condition and the quality of the materials received is acceptable. We requested the material to initiate a project attempting to develop Potato PVY resistance. These accessions were reported to be PVY resistant and will be used as our positive control. So far, accession PI 175446 was tested as PVY^{NTN} resistance positive in our inoculation system. We will test certain other accessions and PVY strains to get the best one as our benchmark for PVY resistance study. We do not have any publication or other results from them yet."

4) Thomas Perot: Sonoma Valley Ecology Center, CA

"The potato material shipped has been transplanted recently as the acquisition has since been re-propagated and planted out on a local organic garden in a current "food-desert" of Sonoma. The garden is shared by family, friends, tenants and neighbors who pitch in and help to raise food for each other and themselves. The material may later be propagated, and multiplied to grow more at the local community garden, as I am also a volunteer/class leader there. All items shipped were shipped well packaged, were of very good conditions, and were in excellent condition to grow and propagate. This will be the first year of field testing the

crops, but so far they seem adequately suited to this environment, and the various local pests. There have been no signs of an adverse virus or something that could contaminate other crops, and I feel the services of NRSP6 have been of the top most quality."

5) Joseph C. Kuhl: Asst. Professor Plant, Soil, & Entomological SciencesUniversity of Idaho

"In 2009, 21 accessions were received for initiation of two separate projects. All the material arrived in excellent shape (mini-tubers and *in vitro* plantlets). All plants performed well in a greenhouse environment. The first project was to provide potato genotype controls in a genetic diversity study of three potato cultivars from Tierra del Fuego. DNA was successfully extracted and markers applied. Although the results have yet to be analyzed, it is hoped that this work will result in a publication. The second project was the use of *Solanum phureja* genotypes for the generation of diploid plants from tetraploid females. This project successfully generated a number of diploid lines and these will continue to be evaluated and utilized for a number of ongoing projects related to the female parental material."

6) Tom Wagner: Everett, WA 98204

"The material arrived in good shape and has been planted in two field locations, Snohomish and Skagit Counties. The plots are being used for making field hybrids, and the increased tubers will be planted next year for yet further crosses and evaluation for consumer acceptance."

7) Tony Chen: OSU, Department of Horticulture

"The materials I received from NRSP-6 have been used for studying the expression of cold regulated genes in relation to frost tolerance. We had no publication in 2009 on the use of the requested materials."

8) Josh Austin: Austin Farms, WA

"I just wanted to inform you that the potato sets did not show up for me to test them. I wish I had more info to give but they were never in my possession."

9) Salomon Yilma, Crop Scieence, Oregon State University

"The clones received from PI center are used in crossing blocks to generate progenies for approved trials for specialty potato breeding."
TITLE: Genetic analysis of durable late blight resistance in potatoes: towards marker-assisted breeding. I, Vales & S. Yilma (LBR9)

Submitted to 2010 PAA : Genetic Analysis of Horizontal Resistance to Late Blight in a Tetraploid Potato Breeding Population Yilma, Solomon, José Ortega and M. Isabel Vales. Oregon State University, Dept. of Crop and Soil Science, Corvallis, OR 97331, USA. (LBR9)

TITLE: Fast-Track Molecular Marker-Assisted Introgression of Extreme Resistant to Potato Virus Y (PVY) in Specialty Potatoes I. Vales, S. Yilma, E. Karaagac P. Hamm, C. Brown (All listed clones received from PI center used in crossing block)

No.	Accession	Clone
1	PI599265	LBR-8
2	PI599266	LBR-9
3	AV 19	Kennebec
4	PI343201	MPI 63.633/63
5	PI199102	Victor
6	PI310467	Desiree
7	PI407417	Bintje
8	PI587077	Spunta
9	PI607502	Tacna
10	PI619152	Meduza
11	PI 634530	Reiche
12	PI 634531	Costanera
13	PI642445	M200-30

10) Rick Machado:Machado Farms,CA

"We have been receiving germaplasm from Max and Jesse at Sturgeon Bay for over 10 years now. We are breeding strictly for heat and drought tolerance in the deserts of Southern California. The standout by far was Bora Valley, a blue/blue tuber from South Korea. It is medium size, heavy producing, and extremely heat and drought tolerant. The blue flesh ranges from light to dark blue, and from all blue to partially blue/white. Lt-2 is a good producer in our heat, although it doesn't produce as well as Bora Valley. Reich also does well, but has a larger dormancy period.
We have received TPS, and the best has been an s.chacoense variety, which is dormant in the winter, and germs in the summer heat. We have some TPS as a result of a natural cross between s.chaco and Bora Valley, but the progeny are so far inconsistent.
Our latest planting is some other S. Korean varieties, Juice Valley, Gogu Valley, Stick Valley, and so on. The plants look beautiful, very large and many flowers. We can't report on them until, after we harvest.
Finally, Max and Jesse have been incredibly open and honest with me, as well as generous and supportive. Life would be a lot less interesting without the help of this, and all other, repositories."

11) Roberto Foss:Mayan Language and Culture Program International Instittute of Los Angeles

"Our inner-city gardening project received several samples of tissue-culture from USPG (NRSP-6). The project includes families from inner city neighborhoods in Los Angeles, in the Latino community and among Mayan speaking peoples. We had a short session on plant domestication, and genetics. We learned how to grow a plant from a tissue cultured plantlet, how to nurture potato species, and about the great diversity in potato plants, leaf patterns and growth patterns. We learned about tuber formation and the great variety of potatoes. We also discussed the nutritional value of potatoes. The participants were especially interested in the blue and red varieties. We are grateful for this opportunity to teach about basic techniques in biology to young people as well as help them to gain an appreciation of biodiversity, and the importance of genetic diversity for world food security. Thank you. "

12) Michael Appley: Last Chance Research Gardeners, CA

"I'm sorry. I didn't get those in the ground, and they died. Sorry"

13) Peter van Hest, Ph.D Bejo seeds, Inc., CA

"Each year we select up to 50 lines available at the NRSP-6 for distribution. The material is seeded or planted and evaluated for use in our potato (true seed) breeding program. As such I am not at liberty to say what exactly we subject the material to. If suitable we continue to work with it as we see fit. Once we have lines to register, and NRSP-6 germplasm has contributed to that line, we will acknowledge it at that time. I trust this is satisfactory for your report.
Sincerely"

14) Julius Lenox, Layton UT

"The list of accessions I received is as follows.

3 AV 20 - NR6 - *Solanum tuberosum*
4 PI 184903 - NR6 - *Solanum tuberosum subsp. andigenum*
5 PI 214429 - NR6 - *Solanum tuberosum subsp. andigenum*
6 PI 217448 - NR6 - *Solanum tuberosum subsp. andigenum*
7 PI 233993 - NR6 - *Solanum tuberosum subsp. andigenum*
8 PI 243402 - NR6 - *Solanum tuberosum subsp. andigenum*
9 PI 246514 - NR6 - *Solanum tuberosum subsp. andigenum*
10 PI 246555 - NR6 - *Solanum tuberosum subsp. andigenum*
11 PI 255494 - NR6 - *Solanum tuberosum subsp. andigenum*
12 PI 281020 - NR6 - *Solanum tuberosum subsp. andigenum*
13 PI 281141 - NR6 - *Solanum tuberosum subsp. andigenum*
14 PI 558144 - NR6 - *Solanum tuberosum subsp. andigenum*
15 PI 161401 - NR6 - *Solanum tuberosum subsp. tuberosum*

I still retain seed of each of the following stored in 0 degree storage facility.
Germination to harvest Testing of all species is scheduled for Growing season of 2011.
There have been some preliminary germination tests which validated that the seed that was received was viable and had good germination rates. The germination rates were 95% and

plants matured past primary leaf pairs. Please feel free to inquire of status next year for further updates on this germplasm."

15) Steve Ripple: Cache County Master Gardeners, Logan, UT

"I appreciate the germplasm we received. Unfortunately, the material was pretty small and dried out (I requested it rather late in the season and was sent what was still available). I was only able to produce 3 seedlings for planting into the test plot in the garden. My goals were to test some materials out for use in rather dry and harsh conditions here in Utah. The material thrived at first, but neither accession produced much in the way of tubers that could be harvested and overwintered. I suspect that this was due to a couple factors, the late rearing and planting of the material, as well as the low amount of water the plants received. I do plan on trying more in the future. Our master gardener program now has a plot of ground of it's own to conduct tests and experiments."

16) M. Isabel Vales et al.: Oregon State University , Corvallis, OR

In 2009, more than 400 successful crosses were made between promising long russets, chippers, reds and specialties clones and parental clones with known resistance to tuber worm, PVY, PLRV, late blight, corky ring spot, and nematodes. More than 70,000 seedling tubers from TPS were produced in Corvallis greenhouses for Oregon single-hill screening for 2010 planting. In addition, 40,000 B and C size seedling tubers were sent to Texas A&M University and the University of Minnesota for 2010 planting. In 2009, approximately 90,000 single-hills (including seedling tubers from OR and ID) were planted at Powell Butte and Klamath Falls. Selections included 762 russet types (0.9% selection rate), 58 chip (1.6% selection rate), and 51 specialty (1.1% selection rate) with potential resistance to late blight, nematodes, PVY, potato tuber worm, powdery scab, black dot, and *Verticillium* wilt. Additional selections were made at other stages including preliminary yield trials and replicated Statewide, Tri-State, and Western Regional trials. All cooperating Oregon locations (Hermiston, Powell Butte, Ontario, Klamath Falls and Corvallis) screened numerous advanced selections in various trials in 2009. The following Oregon-selected potato cultivars were officially released in 2009: Owyhee Russet (AO96160-3, long russet), Purple Pelisse (POR01PG16-1, fingerling with purple skin and flesh), Red Sunset (AO93487-2R, round with red skin and white flesh), and Crimson Red (COO86107-1R, round with red skin and white flesh).

Many potato clones used in the OSU crossing block were derived from material provided by NRSP6 directly or indirectly via more advanced versions provided by our collaborators (Chuck Brown, Rich Novy and others). A few examples illustrating the use of NRSP6 germplasm follow.We continue using three different sources of resistance to Potato Virus Y (PVY) in our breeding program, one source traces back to *S. tuberosum andigena,* another to *S. stoloniferum* and a third one present in the variety Premier Russet (probably derived from the parental line Summit). Molecular markers associated with the first two sources of resistance are used as indirect selection tools (MAS: Marker-Assisted-Selection).

Journal articles:

2010. Novy, R.G., J.L. Whitworth, J.C. Stark, S.L. Love, D.L. Corsini, J.J. Pavek, **M.I. Vales**, S.R. James, D.C. Hane, C.C. Shock, B.A. Charlton, C.R. Brown, N.R. Knowles,

M.J. Pavek, T.L. Brandt, S. Gupta, and N. Olsen. Clearwater Russet: A Dual-Purpose Potato Cultivar with Cold-Sweetening Resistance, High Protein Content, and a Low Incidence of External Defects and Sugar Ends. Amer. J. Potato Res. (in press)

2010. Stark J.C., R.G. Novy, J. L.Whitworth, N.R. Knowles, M.J. Pavek, S.L. Love , **M.I. Vales**, S.R. James, D.C. Hane, C.R. Brown, B.A. Charlton, D.L. Corsini, J.J. Pavek T.L. Brandt, and N. Olsen. Classic Russet: A Potato Cultivar with Excellent Fresh Market Characteristics and High Yields of U.S. No. 1 Tubers Suitable for Early Harvest or Full-Season Production. (in press)

2010. Karaagac, E., S. Yilma and **M.I. Vales**. SSR-Based DNA Fingerprinting of Potato Clones from the Pacific Northwest Potato Variety Development Program. *Acta Horticulturae* 859: 121-127.

2010. **Vales, M.I.,** R.J. Ottoman, J.A. Ortega, S. Yilma and E. Karaagac. Marker-Assisted Selection for PVY Resistance in Tetraploid Potatoes. *Acta Horticulturae* 859: 409-416.

2009. Gandhi H.T., **M.I. Vales**, C. Mallory-Smith, and O. Riera-Lizarazu. Population structure of *Aegilops cylindrica* Host in its native range and in the United States of America. Theor. Appl. Genet. 119 : 1013-1025.

2009. Whitworth J.L., R.G. Novy, J.C. Stark, J.J. Pavek, D.L. Corsini, **M.I. Vales**, A.R. Mosley, S.R. James, D.C. Hane, C.C. Shock, B.A. Charlton, N.R. Knowles, M.J. Pavek. Yukon Gem: A yellow-fleshed potato cultivar with resistance to PVYO and late blight. Amer. J. Potato Res. Submitted.

2009. Rondon S.I., D.C. Hane, C.R. Brown, **M.I. Vales**, M. Dogramaci. Screening potato clones for resistance to Potato Tuberworm, *Phthorimaea operculella* Zeller (Lepidoptera: Gelechiidae). J. of Ec. Entomol. 102: 1649-1653.

2009. Ottoman R.J., D. Hane, C.R. Brown, S. Yilma, A.R. Mosley, and **M.I. Vales.** Validation and implementation of marker-assisted selection (MAS) for PVY resistance (Ry_{adg} gene) in a potato breeding program. Amer. J. Potato Res. 86: 304-314.

2009. Stark, J.C., R.G. Novy, J.L. Whitworth, S.L. Love, D.L. Corsini, J.J. Pavek, **M.I. Vales**, S.R. James, D.C. Hane, B.A. Charlton, C.R. Brown, N.R. Knowles, M.J. Pavek, T.L. Brandt, and N. Olsen. Highland Russet: A full season, processing variety with high yields of uniform U.S. No. 1 tubers. Amer. J. Potato Res. 86: 171-182

2009. Brown C.R., H. Mojtahedi, J.M. Crosslin, S. James, B. Charlton, R.G. Novy, S.L. Love, **M I. Vales** and P. Hamm. Characterization of Resistance to Corky Ringspot Disease in Potato: A Case for Resistance to Infection by Tobacco Rattle Virus. Amer. J. Potato Res. 86: 49-55.

Table 1. List of 2009 Western Region Orders

Appley, Michael mappley66@gmail.com PHONE: (831) 459-0577 FAX: ***** 1 units shipped in 1 order/s	Last Chance Research Gardens 588 Swanton Road Davenport, California 95017
Arnold, Mark markelliottarnold@gmail.com PHONE: (801) 546-4821 FAX: ***** 6 units shipped in 1 order/s	2183 North 1975 East Layton, Utah 84040
Austin, Josh jacoldwell@yahoo.com PHONE: (360) 790-6297	Austin Farms 7700 Spurgeon Creek Road SE Olympia, Washington 98513

FAX: *****
1 units shipped in 1 order/s

Bates, Cassandra
cbates@uidaho.edu
PHONE: (208) 885-7020
FAX: 208-885-7760
20 units shipped in 1 order/s

University of Idaho
Department of PSES
Moscow, Idaho 83844

Borman, Mr. Dan
dan.borman.food.plants@gmail.com
PHONE: (360) 966-9708
FAX: *****
20 units shipped in 1 order/s

2193 E Smith Road
Bellingham, Washington 98226

Chen, Dr. Tony
chent@hort.oregonstate.edu
PHONE: (541) 737-5444
FAX: 541-737-3479
9 units shipped in 1 order/s

Oregon State University
Department of Horticulture
Corvallis, Oregon 97331

Chills, Holly
itschills@sbcglobal.net
PHONE: (916) 944-3467
FAX: *****
4 units shipped in 1 order/s

Mother Earth Garden
3426 Grant Park Drive
Carmichael, California 95608

Conner, Lee Ann
leeann@ahimsainternational.org
PHONE: (530) 549-3232
FAX: *****
1 units shipped in 1 order/s

Ahimsa International (NGO)
PO box 1106
Bella Vista, California 96008

Deppe, Carol
*****
PHONE: (541) 745-7002
FAX: *****
4 units shipped in 1 order/s

7263 NW Valley View Dr.
Corvalles, Oregon 97330

Facciola, Stephen
kzyl-uruk@worldnet.att.net
PHONE: (760) 726-0990
FAX: *****
2 units shipped in 1 order/s

Kampong Publications
1870 Sunrise Dr.
Vista, California 92084

Foss, Robert
betoangel@aol.com
PHONE: (213) 291-1551
FAX: *****
11 units shipped in 1 order/s

Foss & Torres
205 S. Broadway #1020
Los Angeles, California 90012

Goyer, Aymeric
aymeric.goyer@oregonstate.edu
PHONE: (541) 567-8321

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

FAX: (541) 567-2240
56 units shipped in 1 order/s

Holm, Dr. David G.
spudmkr@lamar.colostate.edu
PHONE: (719) 754-3594
FAX: 719-754-2619
63 units shipped in 1 order/s

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

Karasev, Alexander
akarasev@uidaho.edu
PHONE: (208) 885-2350
FAX: (208) 885-7760
6 units shipped in 1 order/s

University of Idaho
Department of PSES
Moscow, Idaho 83844

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

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

Lenox, Julius
brlenox@gmail.com
PHONE: (801) 444-9220
FAX: *****
13 units shipped in 2 order/s

2269 North 2100 East
Layton, Utah 84040

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

Machado Farms
26501 Wickard Road
Menifee, California 92584

McGaughey, Donna
dmcgaughey@gmail.com
PHONE: (206) 842-4338
FAX: *****
2 units shipped in 1 order/s

Small Family Sustainability
641 Eaglecliff Road NE
Bainbridge Island, Washington 98110

Merlin, Andrew
catplants@gmail.com
PHONE: (909) 483-4058
FAX: *****
4 units shipped in 2 order/s

Pink Lily
14252 Club View Drive
Lytle Creek, California 92358

Parker, Carrol
carrolparker@tcsn.net
PHONE: (509) 586-4081
FAX: *****
1 units shipped in 1 order/s

Parker Organics
182509 E Game Farm Road
Kennewick, Washington 99337

Perot, Thomas
tmperot@gmail.com
PHONE: (707) 939-2966

crfg, Sonoma Valley Ecology Center
847 Towne St.
Sonoma, California 95476

FAX: *****
2 units shipped in 1 order/s

Ripple, Steve
steveripple@comcast.net
PHONE: (435) 752-2732
FAX: *****
3 units shipped in 1 order/s

Cache County Master Gardeners
900 East Center Street
Logan, Utah 84321-4928

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

J.R. Simplot Company
5369 W. Irving Street
Boise, Idaho 83706

Simpson, Larissa
lsimpson@carollo.com
PHONE: (602) 526-7674
FAX: *****
6 units shipped in 1 order/s

Decade Manufacturing
12001 N 30th St.
Phoenix, Arizona 85028

Spurlin, Maria
2ugly2c@sbcglobal.net
PHONE: (530) 223-6333
FAX: *****
2 units shipped in 1 order/s

9461 Clough Canyon Road

Redding, California 96003

Tolbert, Terry
terry_tolbert@blm.gov
PHONE:
FAX: *****
1 units shipped in 1 order/s

Escalante Interagency Office
755 West Main Street
***** Escalante, Utah 84726

Valadez, Stephanie
stephanievaladez@hotmail.com
PHONE: (951) 657-0562
FAX: *****
1 units shipped in 1 order/s

Valadez Farm
2478 Johnston St.
Perris, California 92571

---

van Hest, Peter
pvanhest@bejoseeds.com
PHONE: (805) 473-2199
FAX: 805-473-0897
66 units shipped in 3 order/s

Bejo Seeds, Inc
1972 Silver Spur Place
Oceano, California 93445

Wagner, Thomas
thoswagner@yahoo.com
PHONE: (425) 512-0313
FAX: *****
251 units shipped in 3 order/s

8407 18th Avenue West
Everett, Washington 98204

Westlake, Jeremy
jeremy_w1993@hotmail.com
PHONE: (425) 233-2729

Hiddenbrook Poultry
42704 SE 120th St.
North Bend, Washington 98045

FAX: *****
2 units shipped in 1 order/s

Whitcher, Steve
master@gurugardener.com
PHONE: (253) 460-5628
FAX: 509-463-6299
24 units shipped in 1 order/s

The Guru Gardener
2804 Rochester St W
University Place, Washington 98466

White, Preston
admin@adison.edu
PHONE: (970) 209-9201
FAX: *****
32 units shipped in 2 order/s

Adison University
1978 Jupiter Dr.
Montrose, Colorado 81401

Yilma, Solomon
solomon.yilma@oregonstate.edu
PHONE: *****
FAX: *****
3 units shipped in 1 order/s

Oregon State University
Crop and Soil Sciences Department
Corvallis, Oregon 97331

2009 USDA - ARS GERMPLASM ORDERS and USE

Bamberg, Dr. John
john.bamberg@ars.usda.gov
PHONE: (920) 743-5406
FAX: 920-743-1080
USDA, ARS
Potato Introduction Station
Sturgeon Bay, Wisconsin 54235
206 units shipped in 8 order/s

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
75 units shipped in 1 order/s
We are continuing to mine diploid germplasm in search of examples of high total carotenoids. These will be examined eventually to test the utility of molecular markers being developed to synthesize a new breeding population at the tetraploid level that will express high total carotenoids.

Busse, Jim
james.busse@ars.usda.gov
PHONE: (608) 890-1394
FAX: 608-262-4743
USDA, ARS
University of Wisconsin - Dept of Hort
Madison, Wisconsin 53706
12 units shipped in 2 order/s

Chung, Yong Suk
saga137@gmail.com
PHONE: (608) 262-8324
FAX: 608-262-4743
University of Wisconsin
Department of Horticulture
Madison, Wisconsin 53706
3 units shipped in 1 order/s

Deahl, Dr. Ken L.
Ken.deahl@ars.usda.gov
PHONE: (301) 504-5131
FAX: 301-504-5555
USDA, ARS
Vegetable Laboratory
Beltsville, Maryland 20705
17 units shipped in 1 order/s

Halterman, Dr. Dennis
dennis.halterman@ars.usda.gov
PHONE: (608) 265-2144
FAX: 608-263-2626
University of Wisconsin
Department of Plant Pathology
Madison, Wisconsin 53706
8 units shipped in 1 order/s
Dennis Halterman: We are using wild potato species to look for natural diversity at loci involved in resistance to late blight. New isolates of the pathogen have been identified that

are able to overcome broad spectrum resistance genes such as Rpi-blb1. We are using the natural diversity found at the Rpi-blb1 locus in several wild species to find out more about the molecular interactions that take place between the Rpi-blb1 protein and its corresponding pathogen effector protein IPI-O. Using this information we will engineer new variants of Rpi-blb1 that are effective against resistance breaking strains of the pathogen.

In collaboration with Shelley Jansky, we are using wild species to identify genetic variability at the Ve locus, which confers resistance to Verticillium dahliae. We plan to use the natural genetic variation to develop a molecular marker that is effective for integration and tracking of Verticillium wilt resistance from multiple germplasm sources.

Haynes, Dr. Kathy
Kathleen.Haynes@ars.usda.gov
PHONE: (301) 504-7405
FAX: 301-504-5555
USDA, ARS - Vegetable Laboratories
10300 Baltimore Avenue
Beltsville, Maryland 20705-2350
97 units shipped in 2 order/s

Jansky, Dr. Shelley
shelley.jansky@ars.usda.gov
PHONE: (608) 262-8324
FAX: 608-262-4743
University of Wisconsin
Department of Horticulture
Madison, Wisconsin 53706
528 units shipped in 11 order/s

Jansky NRSP-6 germplasm requests FY10

In the past year, we have used NRSP-6 germplasm to identify new sources of PVY resistance, carry out genetic studies of PVY resistance, and determine whether clones resistant to PVY^{O} are also resistant to PVY^{NO}. We have evaluated tuber starch amylose content in a broad screen of wild species and a fine screen of *S. microdontum* accessions. An exceptional *S. raphanifolium* accession for resistance to cold sweetening was used as a parent to develop populations segregating for that trait. Clones in these populations are being evaluated for invertase activity as the basis for resistance to cold sweetening. A set of Verticillium wilt resistant and susceptible accessions is being used to develop a broad spectrum resistance marker based on the tomato *Ve* gene. Gene bank germplasm has also been used in a number of additional studies, including testing of a bridge crossing method for 1 EBN species, development of self-compatible diploids, comparison of diploid and somatically doubled tetraploid clones, induction of haploids, and evaluation of soft rot resistance and tuber amylose content in foreign cultivars

Ling, Kai-Shu
kai.ling@ars.usda.gov
PHONE: (843) 402-5313
FAX: (843) 573-4715
USDA-ARS - US Vegetable Laboratory
2700 Savannah Highway
Charleston, South Carolina 29414
2 units shipped in 1 order/s

Manter, Daniel
daniel.manter@ars.usda.gov
PHONE: (970) 492-7255
FAX: *****
10 units shipped in 1 order/s

USDA, ARS - SPNR
2150 Centre Ave.
Fort Collins, Colorado 80526

McCord, Per
per.mccord@ars.usda.gov
PHONE: (509) 786-9559
FAX: *****
4 units shipped in 1 order/s

USDA, ARS
24106 N Bunn Road
Prosser, Washington 99350

Navarre, Dr. Duroy A.
University
roy.navarre@ars.usda.gov
PHONE: (509) 786-9261
FAX: 509-786-9277
388 units shipped in 4 order/s

USDA, ARS - Washington State

Department of Plant Pathology
Prosser, Washington 99350

Novy, Dr. Richard
rich.novy@ars.usda.gov
PHONE: (208) 397-4181
FAX: (208) 397-4311
49 units shipped in 3 order/s The stocks I ordered were andigena clones for their bright yellow flesh as well as Alca Tarma for its PLRV resistance.They were also European varieties and a Peruvian variety requested for their disease/pest resistances. All were to be used as parents in the crossing block.

USDA, ARS
University of Idaho R&E Center
Aberdeen, Idaho 83210-0530

Picton, Deric
deric.d.picton@aphis.usda.gov
PHONE: (301) 313-9214
FAX: (301) 504-8539
4 units shipped in 1 order/s

USDA-APHIS-PPQ-CPHST
National Plant Germplasm and Biotech
Beltsville, Maryland 20705

Ruess, Holly
ruess@wisc.edu
PHONE: (608) 262-0159
FAX: 608-262-4743
42 units shipped in 3 order/s

University of Wisconsin
Department of Horticulture
Madison, Wisconsin 53706

Spooner, Dr. David
david.spooner@ars.usda.gov
PHONE: (608) 264-5213

University of Wisconsin
Department of Horticulture
Madison, Wisconsin 53706

FAX: 608-262-4743
3 units shipped in 1 order/s .
I have used NRSP-6 germplasm for morphological and molecular studies to redefine what is a wild potato species and to investigate their interrelationships. I have also used it for redefining the species boundaries and evolution of cultivated potatoes. Another area of research is to test the association between taxonomy and traits of interest (predictivity studies).

Whitworth, Dr. Jonathan
jonathan.Whitworth@ars.usda.gov
PHONE: (208) 397-4181
FAX: *****
USDA, ARS
PO Box 870
Aberdeen, Idaho 83210
3 units shipped in 2 order/s

Status of the Potato Quarantine Program, 2010

Presented to the Potato Crop Germplasm Committee

August 17, 2010 in Corvallis, OR

by

Jorge Abad, PhD
Senior Plant Pathologist-Project Leader
Potato and Sweet Potato Quarantine Programs
Registration, Identification, Permitting and Plant Safeguarding (RIPPS)
Plant Health Programs (PHP)
Plant Protection and Quarantine (PPQ)
USDA APHIS
Bldg. 580, Powder Mill Road, Beltsville, MD 20705
Phone 301-504-8630
Email jorge.a.abad@aphis.usda.gov

Introduction

The mission of the Potato Quarantine Program (PQP) is to test germplasm for pathogens as a condition for the entry of this valuable plant into the United States. Special emphasis is given to the detection of viruses, viroids and bacteria including phytoplasmas. This program is the first line of defense against the inadvertent introduction of new potato diseases into the USA. Such diseases have the potential to create both economical and environmental burden to the crop. Additionally, in our program, any infected accession is subjected to therapy for the elimination of pathogens and then retested to ensure the success of the treatment. Eventually all the accessions are released to the requesters.

The PQP has a strong and an efficient collaboration with the NRSP-6 promoting the acquisition and further use of clean germplasm.

Staff

No changes occurred in the program during 2009 and 2010 in our staff. Crindi Loschinkohl, our crop specialist, continues sharing with us her expertise in acquisition, testing, and distribution of potatoes. Maggie Smither, our tissue culture specialist, also continues doing an outstanding job in managing the daily activities of the tissue culture lab as well as the therapy program. Richard Slocum, also a tissue culture specialist, continues working with other crops. Both specialists will soon start the cryogenic procedures of therapy. Our two student-technicians from the University of Maryland at College Park, Prat Bandla and Krishna Amin, continue supporting our program and Seth Pack, our gardener is doing an excellent job in the greenhouse work and helping Crindi with the biological tests. The PGQP continues under the leadership of Dr. Joseph Foster.

Accomplishments

Over the past year our PGP continue improving pathogen detection tests for potato diseases. This includes biological and molecular based methods. Generic primers for luteoviruses in addition to carlaviruses, potexviruses, potyviruses and geminiviruses are well implemented for RT-PCR and PCR, respectively. Our Molecular Lab. Supervised by Dr. Clarissa Maroon-Lango is testing routinely for all those groups of viruses. Therapy is being improved by implementing Cryotherapy. Finally, Maggie Smither, our Tissue Culture Specialist, was trained by Dr. Barbara Reed, a USDA-ARS expert in cryopreservation in Corvallis, OR. We expect to start working with Cryotherapy by October this year.

As an additional accomplishment we can mention that the back log for TPS testing of lots of germplasm collected from 1993 to 2001 was finally cleared in the spring of 2010. See the details in Table 3.

Potato germplasm acquisition and releases

Our inventory for 2009-2010 consisted of 46 potato. It includes all the acquired and released germplasm as well as the clones in therapy for 2011.

During fall 2009 to spring 2010, our program tested 46 clones and 13 introductions of true potato seeds (TPS). All of the new potatoes clones were received cultured *in vitro.* From previous years, three clones were received from Chile in 2006 for G. Secor. In 2007, five clones were received, two from Chile for G. Secor, two clones from China for D. Douches and one from Ireland for R. Novy. In 2008 10 clones were received, One clone from Germany for S. Aarestad, two from Peru for D. Douches, One from Peru for M. Martin, three from Germany for L. Privalle and three from Scotland for G. Secor.

From May to December 2009, 28 clones were received (Table 1).

For TPS testing at PGQO during 2009-2010, we had 13 TPS lots that were grown at the Potato Repository in Sturgeon Bay, WI. One accession was from Bolivia and 12 from Guatemala (Table 2). Although 22 lots were sown at the repository, only 13 germinated.

Based on the test results, PGQP released and distributed 37 clones and 13 TPS entries this year to 9 recipients. Nine clones that were positive will remain in therapy.

Pathogens intercepted this year included: *Potato virus S* (PVS) and *Potato leafroll virus.* Detections were made only in clonal accessions.

Obtaining foreign germplasm

Federal law (Title 7 of the Plant Pest Act) prohibits the importation of plant parts for use in vegetative propagation of some 50 plant genera, including tuber-bearing *Solanum* spp. Importation of true potato seed (TPS) is also prohibited. The quarantine period for potatoes is typically 6-7 months. Potatoes generally are acquired from foreign donors or institutes or from plant exploration as seed lots of 200 seeds or more, as tubers, or as *in vitro* plantlets. All acquisitions must be accompanied by an import label issued by the PGQP pathologist for potato. Potato slots are filled and processed on a "first-come, first-served" basis. The indexing season for potatoes (based on greenhouse growing conditions for indicator plants) is September through May. Requests for potato importation should be submitted between January and June preceding the September start of the testing cycle.

The Potato Crop Germplasm Committee is considered an important component in the plant introduction system. The committee can help by taking an active role in developing and submitting an annual prioritized request for potato germplasm to the PGQP.

Acknowledgments

The Potato Quarantine Program is operating nearly without backlogs. This

accomplishment would not be possible without the dedicated and outstanding work of our personnel at the PGPQ. I want also to acknowledge Dr. Joseph Foster, our Director for his guidance and encouragement. Also, to Dr. Clarissa Maroon-Lango at PGPQ, her great collaboration, the outstanding molecular testing in her lab, and her friendship is gratefully appreciated.

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Table 1.- 2009-2010 PGQP Potato Season

Clonal Potatoes

There were 46 potato clones in the PGQP in the 2009-2010 seasons.

All but one was received *in vitro*

3	clones were received in 2006		
	3	from Chile	for G. Secor
5	clones were received in 2007		
	1	from Chile	for G. Secor
	1	from Ireland	for R. Novy
	1	from Peru	for M. Martin
	2	from China	for D. Douches
10	clones were received in 2008		
	1	from Peru	for M. Martin
	2	from Peru	for D. Douches
	3	from Scotland	for G. Secor
	3	from Germany	for L. Privalle
	1	from Germany	for S. Aarestad
28	clones were received from May to December 2009		
	2	from Poland	for M. Martin
	15	from Chile	for G. Secor
	5	from Germany	for S. Aarestad
	6	from Germany	for Summit Plant Labs
Total of clones:46			
	46 were tested		
	9	were positive	
	37	were released	

Table.- 2

True Potato Seed

22 True Potato Seed lots were sown at the Potato Repository in Sturgeon Bay, WI for J. Bamberg and M. Martin.
(Only 13 of the seed lots germinated).

2	from Colombia
2	from Bolivia
18	from Guatemala

13 TPS seed lot's tissue was sent to PGQP for testing

13 Were released

1	from Bolivia
12	from Guatemala

Table 3. - True Potato Seed from the Sturgeon Bay Repository 2007-2010

These true potato seed lots were collected from 1992 to 2001 and kept at the Repository.
Number of TPS Seed Lots Sown at the Repository **110**
Number of TPS Seed Lots germinated **97**
Number of TPS Seed Lots infected with PSTVd and destroyed **1**
(*S. kurtzianum* from the Russian Federation)
Number of TPS Seed Lots sent to PGQP for testing **96**
Number of TPS Seed Lots infected **1**
(*S. acaule* from Peru) Seeds from this group were grown, put through therapy, and tested as a clonal accession which was released in 2010.

Number of TPS Seed Lots released **95**

Seed Lots Released to the Repository

#	Species	origin
10	*S. acaule*	Bolivia
2	*S. acaule*	Russian Federation
4	*S. agrimonifolium*	Guatemala
1	*S. arnexii*	Bolivia
1	*S. berthaultii*	Germany
1	*S. berthaultii*	Russian Federation
1	*S. brevicaule*	Bolivia
1	*S. brevicaule*	Russian Federation
5	*S. chacoense*	Argentina
1	*S. chacoense*	Bolivia
1	*S. chacoense*	DM
4	*S. chacoense*	Russian Federation
8	*S. clarum*	Guatemala
7	*S. demissum*	Mexico
4	*S. demissum*	Russian Federation
1	*S. doddsii*	Bolivia
3	*S. fendleri*	Russian Federation
1	*S. guerreroense*	Russian Federation
1	*S. hoopesii*	Bolivia
1	*S. latisectum*	Argentia

#	Species	origin
1	*S. leptophyes*	Russian Federation
1	*S. michoacanum*	Russian Federation
1	*S. microdontum*	Russian Federation
1	*S. papita*	Japan
2	*S. papita*	Russian Federation
2	*S. pinnatisectum*	Canada
1	*S. pinnatisectum*	Russian Federation
1	*S. polytrichon*	Japan
2	*S. polytrichon*	Russian Federation
1	*S. punae*	Russian Federation
2	*S. sparsipilum*	Bolivia
1	*S. spegazzinii*	Russian Federation
2	*S. stoloniferum*	Germany
6	*S. stoloniferum*	Russian Federation
2	*S. tarijense*	Bolivia
1	*S. tarijense*	Russian Federation
5	*S. tuberosum*	Russian Federation
1	*S. verrucosum*	Bolivia
1	*S. verrucosum*	Russian Federation
3	*S. yungasense*	Bolivia