ANNUAL REPORT

Calendar Year 2000

1. NRSP-6: INTER-REGIONAL POTATO INTRODUCTION PROJECT

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

2. COOPERATIVE AGENCIES AND PRINCIPAL LEADERS

State Agricultural Experimental Stations		**Representative**
Southern Region	Vice Chairman (2001)	J. C. Miller, Jr.
Western Region	Secretary (2001)	A. R. Mosley
North Central Region	Chairman (2001)	D. S. Douches
North Eastern Region		A. F. Reeves

United States Department of Agriculture

Agricultural Research Service		
Technical Representative		C. R. Brown
National Program Staff		P. K. Bretting
Area Director, Midwest Area		A. Hewings
Cooperative States Research Education & Extension Service		M. Fitzner
Animal and Plant Health Inspection Service		A. T. Tschanz
Inter-Regional Potato Introduction Project	Project Leader	J. B. Bamberg

Agriculture Canada T. R. Tarn

Administrative Advisors

North Central Region	Lead	R. L. Lower
Western Region		M. J. Burke
Southern Region		E. Young
North Eastern Region		D. R. Mackenzie

3. PROGRESS AND PRINCIPAL ACCOMPLISHMENTS

A. Introduction of New Stocks

Dr. Spooner, in collaboration with Alberto Salas (CIP, Peru), and Robert J. Hijmans (CIP, Peru), participated in a successful expedition to collect wild species of potato in Honduras from August 27th to September 4th, and Panama from September 5th to September 14th, 2000. This collection trip resulted in 5 new accessions of *Solanum* species.

A total of 24 accessions were assigned PI numbers in 2000, and are now available from the NRSP-6 *Solanum* germplasm collection: 24 in vitro clones, 20 foreign varieties and 4 species.

B. Preservation and Increase of Stocks

In 2000, 147 accessions were increased as botanical seed populations.

This year a total of 876 potato spindle tuber viroid (PSTV) tests were performed on seed increase parents, seed lots and research materials. Germination tests were performed on 1141 accessions, and ploidy determinations were done on 90 accessions.

The spraying of 2,4-D on pollinated flowers to help in fruit retention and seed production looks promising. This fall, two accessions that had no fruit set after thousands of pollinations, produced fruit and seed after spraying the pollinated flowers with 2,4-D.

The Association of Potato Inter-genebank Collaborators (APIC) constructed a database of all wild potato holdings of the potato genebanks in Argentina, Europe, Peru, and the United States. The Inter-genebank Potato Database (IPD) is available on the internet (www.potgenebank.org/ipd/) and was advertised in a published paper in AJPR Vol.77(6):353-359 covering the inception, importance, and the information available in the IPD.

Comparisons of routinely selected seedling transplants (those being the larger faster germinating plants), to the smaller or slower germinating ones with RAPDs revealed that using only the most vigorous seedlings results in genetic selection.

C. Classification

Dr. Spooner continues to resolve problems in taxonomic classification, which impede efficient documentation and use of the germplasm. This year an extensive study was conducted which suggests several species in the series Longipedicellata are not actually significantly different. Insights gained from this and similar studies will allow accessions to be assigned stable species names based on empirical differences.

D. Distribution

NRSP-6 distributed 8,433 units of seed, 51 tuber families and 1,074 in vitro stocks to clientele in 18 states of the United States and 17 other countries. Internally, NRSP-6 used 5,259 units of seed for chromosome counts, germination tests, identification and taxonomic check plantings, in vitro maintenance, seed increases, PSTV tests, and miscellaneous plantings. The volume and types of stocks sent to various consignee categories are summarized in the table below.

VOLUME AND TYPES OF STOCKS DISTRIBUTED

	Units[1]					
Category	S	TF	IVS	FSG	TOTAL	PIs
Domestic	4,184	51	838	180	5,253	4,114
Foreign	4,249	0	236	284	4,769	3,177
NRSP-6[2]	5,259	0	0	0	5,259	1,378
Total	13,692	51	1,074	464	15,281	8,669

[1] Types of stocks sent/(number of seeds, tubers or plantlets per standard shipping unit): S= True Seeds/(50), TF= Tuber Families/(10), IVS=In Vitro Stocks/(1), FSG=Fine Screening Genotypes/(1).

[2] Includes chromosome counts, germination tests, ID and Taxonomic check plantings, in vitro maintenance, seed increases, PSTV tests, miscellaneous plantings and NSSL seed backup.

E. Evaluation of Stocks

Mission

The project's mission with respect to evaluation is to locate and characterize useful traits so that the best materials and most efficient approaches are available for subsequent germplasm enhancement.

1. Late Blight Screening

We produced progeny of elite genotypes within populations (fine screening and recurrent selection to produce parents with the best breeding value). We made an F2 family of these (out crossed with susceptible diploid *tuberosum*) to test the quantitative nature of resistance. We are using S. *okadae*, which has not been accessed for resistance before, as far as we know. Tubers were tested by W. Stevenson (WI) for tuber late blight resistance. We found that tuber resistance doesn't always follow that of the leaf for some of our elite species selections.

2. *Rhizoctonia* Screening
We provided tubers to D. Carling (AK). *Rhizoctonia* isn't devastating, but there is no way to control it. Good resistance was found in some wild species.

3. Antioxidant Screening
A grant to Dr. L. Phlak at Madison was funded through the potato CGC to check wild species for antioxidants. Potatoes do not have the highest antioxidants, but considering the amount of potatoes eaten per capita, a little increase could have more total beneficial effect than high antioxidant fruits eaten sparingly and infrequently.

4. Glycoalkaloids Screening
We conducted fine screening for glycoalkaloids on families selected for high foliage/tuber differential. We screened 27 individual plants from within elite families with high average foliage/tuber differences. Two of the plants had very broad segregation such that the foliage glycoalkaloid levels were 25-40 times the tuber levels. The prospects of selecting germplasm with insecticidal glycoalkaloids deposited only in the foliage look good.

5. Cold Genetics, Breeding and Physiology
We continued recurrent selection for good tuber characteristics in hybrids of *tuberosum* with extremely cold hardy species. A homemade freezing apparatus seems to be working well, giving quite reproducible results that fit with known species standards. This is necessary because now that we have good tuber type and early maturity, Sturgeon Bay is no longer a useful site to differentiate cold hardiness in the field. We were able to find that we can still recover high levels of cold hardiness despite having heavily selected for early maturity and tuber type.

6. Tuber Calcium Accumulation
Tuber calcium has been shown to be closely associated with resistance to important storage rots and other tuber quality traits. We grew tubers of replicated F2 segregating population of parents that were extremely high and low calcium accumulators when grown under a low calcium environment. Beautiful segregation between the parental extremes was observed. This material should be very useful for researching the genetics and physiology of high tuber calcium (related to tuber quality and disease resistance). Another plus is that we are testing some very promising shortcuts to the laborious analysis protocol that may result in faster, cheaper testing and more reproducible results. We tested field tubers from Weslaco TX for comparison to winter pot-grown results and got a nice correlation (85%) with pot-grown tubers.

7. Hormone Mutants
We extracted DNA for markers to tag GA dwarfing allele in segregating families. Dr. K. Hosaka observed a similar dwarf in the haploid extractor 1.22 and Dr. J. Valkonen in Sweden has a new publication describing a GA dwarf in the variety *Pito* (he called it "*pito"*). We are doing crosses to see if these two others are really the same as, or allelic to *ga1* we described. We found a new mutant in the topiary seedlot of *infundibuliforme*. This has been sent to Jeff Suttle at NDSU to check hormone physiology.

F. Inter-genebank Collaboration

The Association of Potato Inter-genebank Collaborators (APIC) was formed in 1993 to assemble a database of potato germplasm available around the world and to initiate collaborative research projects. Below are some of the projects currently in progress.

1. Comparisons of reputed duplicates in US and VIR genebank with RAPDs.
Differences are small but significant. Scientists should not assume that data generated for items under the same name in the two genebanks are completely interchangeable.

2. Import of rescued seeds from Poland.
Imported over 100 samples of unique VIR genebank accessions that were rescued (seed increased) under a special cooperative USDA/FAS project in Poland (coordinated by Chuck Brown).

3. Visit wild potato populations in New Mexico.
A remarkable observation: Our characterizations of sites may be very poor when based on a single visit. 2000 was reputed to be a very dry year. Only places where potatoes were unusually abundant in 1999 were visited. In some, potatoes could hardly be found. In others they were abundant. The reverse has been observed in a "good" year.

4. "Anasazi *jamesii* rebreeding project". Based on the idea that we might be able to recapture the hypothetical potatoes selected by the Anasazi, we have done one cycle of selection for larger and less bitter tubers of several accessions collected in the southwestern United States.

G. Visitors From Other Countries

Dr. Roy Parfitt	South Africa
Mr. Helun Singsit	India
Dr. Agnes Murphy	New Brunswick, Canada

4. USEFULNESS OF FINDINGS

NRSP-6's purpose is to provide a ready source of raw materials, technology and information which, support potato enhancement, breeding and research in the US and around the world. Thus, one way the success of NRSP-6 can be measured is by the use of NRSP-6 germplasm in the pedigrees of new, improved potato cultivars. Another is in the use of NRSP-6 stocks in more basic research programs, which also ultimately contribute to human utilization of the potato crop, these being reflected in publications.

Four cultivar releases were published in the American Journal of Potato Research in 2000: 'Russet Legend', 'Century Russet', 'AC Stampede Russet', and 'Umatilla Russet.' All are known to have wild species in their pedigrees.

Section 6 lists 89 papers, 30 abstracts, and 4 theses which report the use of NRSP-6 *Solanum* introductions this year.

5. WORK PLANNED FOR 2001

Dr. Spooner will participate in a collecting expedition to Paraguay, Brazil, and Uruguay in 2001.

Evaluation experiments will be continued on *Solanum* species for the following traits: antioxidants, frost hardiness, rooting vigor, tuber calcium, late blight resistance, hormone mutants and glycoalkaloids.

The general objective of NRSP-6 to promote and facilitate potato research and breeding, will be pursued by continuing high quality service with respect to introduction, preservation, classification, evaluation, and distribution of potato germplasm to clients in the U.S. and around the world.

We will continue APIC inter-genebank projects researching the status and dynamics of genetic diversity in the collection using RAPDs, and to strengthen ties with sister genebanks around the world.

6. PUBLICATIONS ISSUED DURING THE YEAR

A. Publications issued by NRSP-6 Personnel

Bamberg, J.B. 2000. Germination of Gibberellin Sensitive *Solanum* (Potato) Botanical Seeds Soaked in GA3 and Re-dried. Am. J. Potato Res. 77:201-202.

Bamberg, J.B., C. Singsit, A.H. del Rio, and E.B. Radcliffe. 2000. RAPD analysis of genetic diversity in *Solanum* populations to predict need for fine screening. Am. J. Potato Res. 77:275-278.

Bamberg, J.B., S. Kiru and A.H. del Rio. 2000. RAPD comparison of reputed duplicate populations in the VIR and US Potato Genebanks. Am. J. Potato Res. 77:392. (Abstract)

del Rio, A.H. and J.B. Bamberg. 2000. Genebank seed increase does not significantly change the RAPD fingerprints of wild *Solanum* (potato) species. Am. J. Potato Res. 77:398. (Abstract)

del Rio, A.H. and J.B. Bamberg. 2000. RAPD markers efficiently distinguish heterogenous populations of wild potato (*Solanum*). Genetic Resources & Crop Evolution 47:115-121.

Douches, D.S., J.B. Bamberg, W. Kirk, K. Jastrzebski, B.A. Niemira, J. Coombs, D.A. Bisognin, and K.J. Felcher. 2000. Evaluation of wild *Solanum* species for resistance to the US-8 genotype of *Phytophthora infestans* utilizing a fine-screening technique. Am. J. Potato Res. (accepted July 2000).

Huaman, Z., R. Hoekstra and J.B. Bamberg. 2000. The Inter-Genebank Potato Database and the Dimensions of Available Wild Potato Germplasm. Am. J. Potato Res. 77:353-362.

Spooner, D.M., A. Rivera-Pena, R.G. van den Berg, and K. Schuler. 2000. Potato Germplasm Collecting Expedition to Mexico in 1997: Taxonomy and New Germplasm Resources. Am. J. Potato Res. 77:261-270.

Vega, S.E., J.P. Palta and J.B. Bamberg. 2000. Variability in the Rate of Cold Acclimation and Deacclimation among Tuber-bearing *Solanum* (Potato) Species. J. Am. Soc. Hort. Sci. 125(2):205-211.

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

Alvarado, V., H. Nonogaki and K.J. Bradford. 2000. Expression of Endo-β-mannanase and SNF-related protein kinase genes in true potato seeds in relation to dormancy, gibberellin and abscisic acid. In: Dormancy in plants: from whole plant behavior to cellular control. (Ed.: J.D. Viemont and J. Crabbe). 347-364.

Barone, A., D. Carputo, G. la Rotonda, A. Sebastiano, and L. Frusciante. 1999. Cytological and genetic studies on 2n pollen formation mechanisms in diploid *phureja-tuberosum* hybrids. J. Genet. & Breeding 53(3):223-230.

Bastia, T., N. Scotti, L. Monti, E.D. Earle, and T. Cardi. 1999. Genetic and molecular analysis of male fertility and cytoplasmic DNA variation in interspecific *Solanum* spp. somatic hybrids. In: Plant biotechnology and in vitro biology in the 21st century. Proceedings of the IXth International Congress of the International Association of Plant Tissue Culture and Biotechnology, Jerusalem, Israel, June 14-19, 1998. (Ed: A. Altman, M. Ziv and S. Izhar). 105-108.

Berg, R.G. van den, M.M. Zevenbergen, J.P. Kardolus, and N. Groendijk-Wilders. 2000. The origin of *Solanum juzepczukii*. In: Proceedings of the Third International Symposium on the Taxonomy of Cultivated Plants, Edinburgh, UK, July 20-26, 1998. (Ed.: S. Andrews, A.C. Leslie and C. Alexander). Royal Botanic Gardens 369-370.

Birhman, R.K. and K. Hosaka. 2000. Production of inbred progenies of diploid potatoes using an *S*-locus inhibitor (*Sli*) gene, and their characterization. Genome 43(3):495-502.

Bisognin, D., and D. Douches. 2000. Genetic Diversity in Diploid and Tetraploid Potato Late Blight Resistant Germplasm. Am. J. Potato Res. 77:393. (Abstract)

Blok, V.C., M.S. Phillips, M.R. Armstrong, J.T. Jones, and D.L. Trudgill. 2000. *Globodera pallida*: heterogeneity within the species. Is this a management problem? Aspects of Applied Biology 59:75-84.

Brodie, B.B., M. Scurrah and R.L. Plaisted. 2000. Release of Germplasm Resistant to Multiple Races of Potato Cyst Nematodes. Am. J. Potato Res. 77:207-209.

Brown, C.R., H. Mojtahedi, G.S. Santo, P. Hamm, J.J. Pavek, D. Corsini, S. Love, J.M. Crosslin, and P.E. Thomas. 2000. Potato Germplasm Resistant to Corky Ringspot Disease. Am. J. Potato Res. 77:23-27.

Buso, J.A., L.S. Boiteux and S.J. Peloquin. 2000. Evaluation under long-day conditions of 4x-2x progenies from crosses between potato cultivars and haploid Tuberosum-*Solanum chacoense* hybrids. Annals Appl. Bio. 136(1):35-40.

Buso, J.A., L.S. Boiteux and S.J. Peloquin. 2000. Heterotic effects for yield and tuber solids and type of gene action for five traits in 4x potato families derived from interploid (4x-2x) crosses. Plant Breeding 119(2):111-117.

Butler, H.T., A. Prevost, J. Allainguillaume, and M.J. Wilkinson. 1999. Genome engineering for pest resistance in potato. In: Genetics and breeding for crop quality and resistance. Proceedings of the XV EUCARPIA Congress, Viterbo, Italy, Sept. 20-25, 1998. (Ed: G.T. Scarascia Mugnozza, E. Porceddu and M.A. Pagnotta). 211-219.

Cardi, T., T. Bastia, L. Monti, and E.D. Earle. 1999. Organelle DNA and male fertility variation in *Solanum* spp. and interspecific somatic hybrids. Theor. Appl. Genetics 99(5):819-828.

Carputo, D., T. Cardi, J.P. Palta, P. Sirianni, S. Vega, and L. Frusciante. 2000. Tolerance to low temperatures and tuber soft rot in hybrids between *Solanum commersonii* and *Solanum tuberosum* obtained through manipulation of ploidy and endosperm balance number (EBN). Plant Breeding 119(2):127-130.

Chani, E., R.E. Veilleux and T. Boluarte-Medina. 2000. Improved androgenesis of interspecific potato and efficiency of SSR markers to identify homozygous regenerants. Plant Cell Tiss. Org. Cult. 60:101-112.

Charlesworth, D. 2000. How can two-gene models of self-incompatibility generate new specificities? Plant Cell 12(3):309-310.

Coombs, J., D. Douches, and K. Deahl. 2000. Glycoalkaloid Analysis of Greenhouse and Field Potato Clones with Host Plant Resistance to Colorado Potato Beetle. Am. J. Potato Res. 77:395-396. (Abstract)

Costanzo, S., B.J. Christ and K.G. Haynes. 2000. Quantitative late blight resistance in an F1 Diploid *Solanum phureja* x *S. stenotomum* population. Am. J. Potato Res. 77:396. (Abstract)

Culley, D., C. Yang, B. Dean, and C. Brown. 2000. Characterization of the Polyphenol Oxidase Gene Family from the Low Browning *Solanum* Species, *S. hjertingii*. Am. J. Potato Res. 77:396-397. (Abstract)

Culley, D., E. Skrzeczkowska, B. Dean, and C. Brown. 2000. Progress Towards Introgression of Blackspot Bruise Resistance from *Solanum hjertingii* into Cultivated Potato Varieties. Am. J. Potato Res. 77:397. (Abstract)

Davies, C.S. 2000. Strategy differences of two potato species in response to nitrogen starvation. Do plants have a genetic switch for nitrogen signaling? Plant, Cell and Environment 23(7):759-765.

De Jong, H. 2000. Candy Cane – a diploid home garden variety. Potato Gene Resources Newsletter.

Dong, F., J. M. McGrath, A.L. Tek, G.T. Haberlach, J.P. Helgeson, and J. Jiang. 2000. Development and Characterization of *Solanum brevidens* Chromosome Additions/Substitutions in Potato. Am. J. Potato Res. 77:398. (Abstract)

Douches, D.S., T.J. Kisha, W. Li, W.L. Pett, and E.J. Grafius. 2000. Effectiveness of natural and engineered host plant resistance in potato to the Colorado potato beetle (Leptinotarsa decemlineata (Say)). HortSci. (accepted December 2000).

Estrada, N. 2000. La ampliacion de la base genetica de la resistenciaa a *Phytophthora infestans* en los programas de mejoramiento genetico de la papa, en la Zona Andina de Suramerica. Primer Congreso iberoamericano de investigacion y Desarrollo en Patata. Vitoria-Gasteiz, Spain. (Abstract)

Estrada, N. 2000. La Biodiversidad en el Mejoramiento Genetico de la papa. Centro de Informacion para el Desarrollo. La Paz, Bolivia. 378 pp.

Estrada, N., C. Nustez, S. Tinjaca, and J. Gabriel. 2000. Cruzabilidad entre *Solanum stoloniferum* y *Solanum palustre*, dos especies silvestres de papa. XVIII Reunion, Asociacion Latinoamericana de Papa (ALAP), Habana, Cuba. (Abstract)

Ewing, E.E., I. Simko, C.D. Smart, M.W. Bonierbale, E.S.G. Mizubuti, G.D. May, and W.E. Fry. 2000. Genetic mapping from field tests of qualitative and quantitative resistance to *Phytophthora infestans* in a population derived from *Solanum tuberosum* and *Solanum berthaultii*. Molecular Breeding 6(1):25-36.

Forapani, S., A. Carboni, E. Castellani, G. Mandolino, and P. Ranalli. 1999. RAPD markers for potato germplasm characterization. J. Genet. & Breeding 53(2):143-147.

Ghislain, M., Z. DaPeng, D. Fajardo, Z. Huaman, and R.J. Hijmans. 1999. Marker-assisted sampling of the cultivated Andean potato *Solanum phureja* collection using RAPD markers. Genet. Res. & Crop Ev. 46(6):547-555.

Ghislain, M., B. Trognitz, R. Nelson, M. del R. Herrera, L. Portal, M. Orillo, and F. Trognitz. 1999. Identification of QTLs for late blight [*Phytophthora infestans*] resistance in a cross between *S. phureja* and a Dihaploid *S. tuberosum* and association with a plant defense gene. In: Impact on a changing world. International Potato Center Program Report 1997-1998. 67-71.

Goth, R.W., P.J. Ellis, G. De-Villiers, E.W. Goins, and N.S. Wright. 1999. Characteristics and distribution of potato latent carlavirus (Red LaSoda virus) in North America. Plant-Dis. (St. Paul, Minn., Am. Phytopathological Society). 83(8):751-753.

Groendijk-Wilders, N., J.P. Kardolus, M.J. Zevenbergen, and R.G. van den Berg. 2000. AFLP, a new molecular marker technique applied to potato taxonomy. In: Proceedings of the Third International Symposium on the Taxonomy of Cultivated Plants, Edinburgh, UK, July 20-26, 1998. (Ed.: S. Andrews, A.C. Leslie and C. Alexander). Royal Botanic Gardens 363-365.

Grondin, G., Y. Pelletier and P. Maltais. 2000. Behavior of the Colorado potato beetle on wild Solanum species. International Plant Resistance to Insects Workshop, Fort Collins, CO, Feb. 28-Mar. 2. (Poster)

Grube, R.C., E.R. Radwanski and M. Jahn. 2000. Comparative genetics of disease resistance within the *Solanaceae*. Genetics 155(2):873-887.

Gundersen, B., D. Inglis, L. Porter, J. Miller, D. Johnson, and C. Brown. 2000. Comprehensive Laboratory and Field Assessment of Resistance to *Phytophthora infestans* Derived from *Solanum hougasii* in a Segregating Breeding Population. Am. J. Potato Res. 77:399. (Abstract)

Hanneman, R.E. Jr. 1999. The reproductive biology of the potato and its implication for breeding. Potato Research 42:283-312.

Hayes, R.J. and C.A. Thill. 2000. Early Generation Selection for Cold Chipping in Diverse Potato Progenies. Am. J. Potato Res. 77:401-402. (Abstract)

Haynes, K.G. 2000. Inheritance of yellow-flesh intensity in diploid potatoes. J. Amer. Soc. Hort. Sci. 125:63-65.

Haynes, K.G. 2000. Two cycles of recurrent selection for specific gravity in diploid potatoes: effect on inheritance of yield and specific gravity. Am. J. Potato Res. 77:402. (Abstract)

Haynes, K.G. and B.J. Christ. 1999. Heritability of resistance to foliar late blight in a diploid hybrid potato population of *Solanum phureja* x *Solanum stenotomum*. Plant Breeding 118(5):431-434.

Haynes, K.G., D.S. Douches, C.A. Thill, G. Secor, W.E. Fry, B.J. Christ, and R.W. Goth. 2000. Foliar resistance to late blight in potato clones evaluated in national trials in 1999. Am. J. Potato Res. 77:402. (Abstract)

Helgeson, J.P. and G.T. Haberlach. 1999. Somatic hybrids of *Solanum tuberosum* and related species. In: Plant biotechnology and in vitro biology in the 21st century. Proceedings of the IXth International Congress of the International Assoc. of Plant Tissue Culture and Biotechnology, Jerusalem, Israel, June 14-19, 1998. (Ed: A. Altman, M. Ziv and S. Izhar). 151-154.

Hosaka, K., H. Matsunaga and K. Senda. 2000. Evaluation of Several Wild Tuber-bearing *Solanum* Species for Scab Resistance. Am. J. Potato Res. 77:41-45.

Huaman, Z., R. Ortiz and R. Gomez. 2000. Selecting a *Solanum tuberosum* subsp. *andigena* Core Collection Using Morphological, Geographical, Disease and Pest Descriptors. Am. J. Potato Res. 77:183-190.

Jansky, S.H. 2000. Breeding for disease resistance in potato. Plant Breeding Reviews. 19:69-155.

Jansky, S.H. and D.I. Rouse. 2000. Identification of potato interspecific hybrids resistant to Verticillium wilt and determination of criteria for resistance assessment. Potato Research. In press.

Kowalski, S.P., J.M. Domek, L.L. Sanford, and K.L. Deahl. 2000. Effect of α-tomatine and tomatidine on the growth and development of the Colorado potato beetle (Coleoptera: Chrysomelidae): studies using synthetic diets. J. Ent. Sci. 35(3):290-300.

Kozukue, N., S. Misoo, T. Yamada, O. Kamijima, and M. Friedman. 1999. Inheritance of morphological characters and glycoalkaloids in potatoes of somatic hybrids between dihaploid *Solanum acaule* and tetraploid *Solanum tuberosum*. J. Ag. Food Chem. 47(10):4478-4483.

Kuhl, J.C., R.E. Hanneman, Jr. and M.J. Havey. 2000. Genetic and molecular characterization of late blight resistance in a 2x(1EBN) Mexican species, *Solanum pinnatisectum*. Am. J. Potato Res. 77:406. (Abstract)

Lafta, A.M. and J.H. Lorenzen. 2000. Influence of high temperature and low light intensity on glycoalkaloid levels in potato leaves. J. Am. Soc. Hort. Sci. 125:563-566.

Landeo, J.A., M. Gastelo, E. Roncal, and A. Mendoza. 2000. Phenotypic Stability for Horizontal Resistance to Potato Late Blight in Population B. Am. J. Potato Res. 77:406-407. (Abstract)

Lantin, S., M. O'Brien and D.P. Matton. 1999. Fertilization and wounding of the style induce the expression of a highly conserved plant gene homologous to a *Plasmodium falciparum* surface antigen in the wild potato *Solanum chacoense* Bitt. Pl. Molecular Bio. 41(1):115-124.

Lantin, S., M. O'Brien and D.P. Matton. 1999. Pollination, wounding and jasmonate treatments induce the expression of a developmentally regulated pistil dioxygenase at a distance, in the ovary, in the wild potato *Solanum chacoense* Bitt. Pl. Molecular Bio. 41(3):371-386.

Lara, F.M., H.L.B. Sargo and A.L. Boica Jr. 2000. Resistance of potato genotypes (*Solanum* spp.) to adults of *Diabrotica speciosa* (Germar) (Coleoptera: Chrysomelidae): feeding nonpreference. Anais da Sociedade Entomologica do Brasil 29(1):131-137.

Laurila, J., I. Laakso, T. Vaananen, P. Kuronen, R. Huopalahti, and E. Pehu. 1999. Determination of solanidine- and tomatidine-type glycoalkaloid aglycons by gas chromatography/mass spectrometry. J. Ag. Food Chem. 47(7):2738-2742.

Lim, H., Y.S. Song, D.M. Khu, C.K. Lim, and J.K. Choi. 2000. Evaluation of Somatic Hybrids Derived from *Solanum etuberosum* and *S. tuberosum* Based on Morphological Characters and Disease Resistance. Am. J. Potato Res. 77:408. (Abstract)

Lopes, M.T.R., J.D. Vendramim and A.P.B.W. Thomazini. 2000. Biology and preference for oviposition of *Phthorimaea operculella* (Zeller) (Lepidoptera: Gelechiidae) on leaves of *Solanum tuberosum* (L.) and *S. berthaultii* (Hawkes) genotypes. Anais da Sociedade Entomologica do Brasil 29(2):319-326.

Lu, W., K. Haynes, E. Wiley, and B. Clevidence. 2000. Colorimetric and Carotenoid Analysis in Diploid Potatoes. Am. J. Potato Res. 77:409. (Abstract)

Lynch, D.R., J.C. Miller, Jr., L.M. Kawchuk, C.A. Schaupmeyer, J. Holley, J. Panford, D.K. Fujimoto, D. Waterer, J. Wahab, B. Rex, and M.S. Goettel. 2000. AC Stampede Russet: A High-Yielding Oblong Russet Cultivar for the French Fry and Fresh Market Industries. Am. J. Potato Res. 77:241-244.

Matthews, D., J. McNicoll, K. Harding, and S. Millam. 1999. 5'-Anchored simple-sequence repeat primers are useful for analyzing potato somatic hybrids. Plant Cell Reports 19(2):210-212.

Matton, D.P., D.T. Luu, X. Qin, G. Laublin, M. O'Brien, O. Maes, D. Morse, and M. Cappadocia. 1999. Production of an S Rnase with dual specificity suggests a novel hypothesis for the generation of new S alleles. Plant Cell 11(1):2087-2097.

McGregor, C.E., C.A. Lambert, M.M. Greyling, J.H. Louw, and L. Warnich. 2000. A comparative assessment of DNA fingerprinting techniques (RAPD, ISSR, AFLP and SSR) in tetraploid potato (*Solanum tuberosum* L.) germplasm. Euphytica 113(2):135-144.

Micheletto, S., M. Andreoni and M.A. Huarte. 1999. Vertical resistance to late blight in wild potato species from Argentina. Euphytica 110(2):133-138.

Monte, E., D. Ludevid and S. Prat. 1999. Leaf C40.4: a Carotenoid-associated protein involved in the modulation of photosynthetic efficiency? Plant J. 19(4):399-410.

Mosley, A.R., S.R. James, C.C. Shock, D.C. Hane, K.A. Rykbost, B.A. Charlton, D.G. Holm, S.L. Love, D.L. Corsini, J.J. Pavek, and R.E. Thornton. 2000. Russet Legend: A Full Season Long Russet for Processing and Fresh Market Use. Am. J. Potato Res. 77:77-81.

Mosley, A.R., S.R. James, D.C. Hane, K.A. Rykbost, C.C. Shock, B.A. Charlton, J.J. Pavek, S.L. Love, D.L. Corsini, and R.E. Thornton. 2000. Umatilla Russet: A Full Season Long Russet for Processing and Fresh Market Use. Am. J. Potato Res. 77:83-87.

Murphy, A.M., H. De Jong and K.G. Proudfoot. 1999. A multiple disease resistant potato clone developed with classical breeding methodology. Can. J. Plant Path. 21:207-212.

Nustez, C. and N. Estrada. 2000. Hibridos interespecificos con *Solanum phureja*, de alto valor agronomico para Colombia. XVIII Reunion, Asociacion Latinoamericana de Papa (ALAP), Habana, Cuba. (Abstract)

Omer, E.A., I. Simko, P.J. Davies, T.L. Setter, D. Vreugdenhil, and E.E. Ewing. 2000. Mapping Polygenes for Hormones Implicated in the Control of Tuberization. Am. J. Potato Res. 77:414-415. (Abstract)

Parrella, G. and T. Cardi. 1999. Transfer of a new PVX resistance gene from *Solanum commersonii* to *S. tuberosum* through somatic hybridization. J. Genet. Breeding 53(4):359-362).

Pelletier, Y. 2000. Resistance to the Colorado potato beetle (Leptinotarsa decemlineata (Say)) in wild *Solanum* species. Centro International de la Papa, Lima, Peru.

Pelletier, Y. 2000. Studying the mode of resistance to the Colorado potato beetle (*Leptinotarsa decemlineata* (Say)) in wild *Solanum* species. International Plant Resistance to Insects Workshop, Fort Collins, CO, Feb. 28-Mar. 2.

Pelletier, Y., C.L. Clark and G.C.C. Tai. 2000. Resistance of three wild tuber-bearing potatoes to the Colorado potato beetle. ESA-ESC-SEQ joint Annual Meeting, Montreal, Quebec, Canada, Dec. 3-6. (Poster)

Pelletier, Y., C.L. Clark and G.C.C. Tai. 2000. Resistance of three wild tuber-bearing potatoes to the Colorado potato beetle. Atlantic Agricultural Sciences and Technology Workshop, Truro, N.S., Canada, Oct. 26-27. (Poster)

Pineros, C., C. Nustez, N. Estrada, M. Caro, and L. Schilde. 2000. Evaluacion de la cruzabilidad y la tolerancia al frio de 17 clones de hibridacion somatica con la especie *Solanum commersonii*, en Colombia. Primer Congreso Iberoamericano de Investigacion y Desarrollo en Patata, Vitoria Gasteiz, Spain. (Abstract)

Platt, H.W. (Bud), E.S. Plissey, G.R. MacKay, M. Adams, M.K. Hinkle, and E. MacDonald. 2000. Sustaining Potato Crop, Land and Industry Health Beyond the Year 2000: Current Issues and Future Needs. In: Am. J. Potato Res. A Symposium Presentation of The Potato Association of America Pathology Section. (Ed.: H.W. (Bud) Platt). 77:333-352.

Raksha, M., and W.M. Tingey. 2000. Glandular trichomes of *Solanum berthaultii* and its hybrids with potato deter oviposition and impair growth of potato tuber moth. Entomologia Experimentalis et Applicata 94(3):249-257.

Rasmussen, J.O., A. Lossl and O.S. Rasmussen. 2000. Analysis of the plastome and chondriome origin in plants regenerated after asymmetric *Solanum* ssp. protoplast fusions. Theor. Appl. Genet. 101(3):336-343.

Rivera-Pena, A. 2000. *Solanum brachycarpum* (Corr): A Wild Tuber-Bearing Species with Resistance to Late Blight (*Phytophthora infestans*). Am. J. Potato Res. 77:416. (Abstract)

Rojas-Cifuentes, G.A., P.M.A. Kianian and R.G. Novy. 2000. Potato RAPD heteroduplexes: Their impact on genetic distance estimates and their use in developing codominant sequence tagged site (STS) markers. Am. J. Potato Res. 77:416-417.

Rokka, V., J.P.T. Valkonen, A. Tauriainen, L. Pietila, R. Lebecka, E. Zimnoch-Guzowska, and E. Pehu. 2000. Production and Characterization of "Second Generation" Somatic Hybrids Derived from Protoplast Fusion Between Interspecific Somatohaploid and Dihaploid *Solanum Tuberosum* L. Am. J. Potato Res. 77:149-159.

Ronning, C.M., S.P. Kowalski, L.L. Sanford, and J.R. Stommel. 2000. Geographical variation of solanidine aglycone glycoalkaloids in the wild potato species *Solanum chacoense* Bitter. Genet. Res. Crop Evo. 47(4):359-369.

Sandbrink, J.M., L.T. Colon, P.J.C.C. Wolters, and W.J. Stiekema. 2000. Two related genotypes of *Solanum microdontum* carry different segregating alleles for field resistance to *Phytophthora infestans*. Molecular Breeding 6(2):215-225.

Santini, M., E.L. Camadro, O.N. Marcellan, and L.E. Erazzu. 2000. Agronomic Characterization of Diploid Hybrid Families Derived from Crosses Between Haploids of the Common Potato and Three Wild Argentinean Tuber-bearing Species. Am. J. Potato Res. 77:211-218.

Sarquis, J.I., N.A. Coria, I. Aguilar, and A. Rivera. 2000. Glycoalkaloid Content in *Solanum* Species and Hybrids from a Breeding Program for Resistance to Late Blight (*Phytophthora infestans*). Am. J. Potato Res. 77:295-302.

Sebastiano, A., L. Frusciante, and A. Barone. 1999. Genetic relationships among *Solanum* genotypes used to introgress the wild *S. commersonii* genome into the tuberosum gene pool. J. Genet. & Breeding 53(2):121-126.

Secor, G.A. and N.C. Gudmestad. 1999. Managing fungal diseases of potato. Can. J. Plant Path. 21(3):213-221.

Senda, K., T. Ito, S. Iketani, N. Murakami, H. Matsunaga, K. Sekiguchi, T. Kon, Y. Mitsui, and S. Aiba. 2000. A new potato variety "Star Queen". Bulletin of Hokkaido Prefectural Agricultural Experiment Stations 78:1-18.

Seppanen, M.M. and K. Fagerstedt. 2000. The role of superoxide dismutase activity in response to cold acclimation in potato. Phys. Plantarum 108(3):279-285.

Seppanen, M.M., T. Cardi, M.B. Hyokki, and E. Pehu. 2000. Characterization and expression of cold-induced glutathione *S*-transferase in freezing tolerant *Solanum commersonii*, sensitive *S. tuberosum* and their interspecific somatic hybrids. Plant Science 153(2):

Shaterian, J., H. De Jong and K. Tanino. 1999. Potential strategies of salt stress resistance in potato lines. Poster presented at Annual Meeting Canadian Society of Plant Physiologists. Saskatoon, SK. (Poster)

Shaterian, J., H. De Jong and K. Tanino. 2000. Identifying key factors conferring salt tolerance in diploid potato genotypes. Presented at Annual Conf. Can. Soc. Hort. Science. (Abstract)

Simko, I., D. Vreugdenhil, C.S. Jung, and G.D. May. 1999. Similarity of QTLs detected for in vitro and greenhouse development of potato plants. Molecular Breeding 5(5):417-428.

Smilyanets', V.P., T.S. Korol' and V.R. Ped'ko. 1997. Mechanisms of resistance of cultivated varieties and wild species of potato against the Colorado beetle. Zakhist Roslin 42:24-29.

Song, J., F. Dong and J. Jiang. 2000. Construction of a bacterial artificial chromosome (BAC) library for potato molecular cytogenetics research. Genome 43(1):199-204.

Szczerbakowa, A., M. Borkowska and B. Wielgat. 2000. Plant regeneration from the protoplasts of *Solanum tuberosum, S. nigrum* and *S. bulbocastanum*. Acta Phys. Plant. 22(1):3-10.

Takacs, A.P., G. Kazinczi, J. Horvath, Z. Bosze, and D. Pribek. 1999. Resistance of new wild *Solanum* species to NTN strain of potato y potyvirus (PVY^{NTN}). In: Proceedings, 51st International Symposium on Crop Protection, Gent, Belgium, May 4, 1999. Part II. Mededelingen – Faculteit Landbouwkundige en Toegepaste Biologische Wetenschappen, Universiteit Gent. 65(3b):513-520.

Thill, C.A. 2000. Minnesota potato breeding program. Proc. National Potato Germplasm Evaluation and Enhancement Report, 1999. 70th Annual Report by Cooperators. USDA/ARS. (Ed.: K.G. Haynes).

Tylicki, A., W. Burza, M. Kuras, E. Dziadczyk, and S. Malepszy. 2000. Structural and ultrastructural analysis of root primordial in vitro cultures (RPC) of *Solanum lycopersicoides* Dun. Plant Science 156(1):73-83.

Uyenoyama, M.K. and E. Newbigin. 2000. Evolutionary dynamics of dual-specificity self-incompatibility alleles. Plant Cell 12(3):310-312.

Valluru, R., B.J. Christ and K.G. Haynes. 2000. Tuber late blight resistance in a diploid hybrid *Solanum phureja* x *S. stenotomum* F1 population. Am. J. Potato Res. 77:422-423. (Abstract)

Valluru, R., S. Costanzo, B.J. Christ, and K.G. Haynes. 2000. Tuber late blight resistance in a diploid hybrid *Solanum phureja-S. stenotomum* F1 population under field and lab conditions. Phytopathology 90:S63. (Abstract)

Voss, R., H. Phillips, K. Brittan, H. Carlson, N. Garrison, M. Gaskell, M. Jimenez, D. Kirby, R. Molinar, J. Nunez, R. Smith, J. Valencia, and G. Veerkamp. 1999. New specialty potato varieties give farmers growing and marketing options. California Agriculture 53(6):16-20.

Yencho, G.C., S.P. Kowalski, G.C. Kennedy, and L.L. Sanford. 2000. Segregation of Leptine glycoalkaloids and Resistance to Colorado Potato Beetle (*Leptinotarsa decemlineata* (Say)) in F2 *Solanum Tuberosum* (4x) x *S. chacoense* (4x) Potato Progenies. Am. J. Potato Res. 77:167-178.

Zhang, R., B.J. Christ and K.G. Haynes. 2000. Early blight resistance in an F1 diploid hybrid potato population of *Solanum phureja* x *S. stenotomum*. Am. J. Potato Res. 77:424. (Abstract)

Zimnoch-Guzowska, E., R. Lebecka and S. Sobkowiak. 1999. An attempt to evaluate potato resistance to *Erwinia carotovora* ssp. *atroseptica* by inoculation of detached leaves. Pl. Breed. Seed Sci. 43(1):101-112.

Zlesak, D.C. and C.A. Thill. 2000. The Occurrence of 2n Pollen in Lake Blight Resistant Wild *Solanum* Accessions. Am. J. Potato Res. 77:424. (Abstract)

C. Theses Reporting Research with NRSP-6 Stocks

Diaz, B.S. 2000. Mapping insect resistance genes in tetraploid potatoes using AFLP markers. Ph.D. Thesis. North Dakota State University-Fargo, ND. 133 pp.

Hamalainen, J. 1999. Molecular mapping of potyvirus resistance genes in diploid potatoes. Thesis, Swedish University of Agricultural Sciences, Sweden. 109 pp.

Kuhl, J.C. 2000. Characterization of late blight resistance and unilateral incompatibility in diploid (1EBN) *Solanum* species. Ph.D. Thesis, University of Wisconsin-Madison. 224 pp.

Villamil, H. 2000. Caracterizacion morfoanatomica de genotipos derivados de especies de *Solanum* resistentes a bajas temperaturas, en Colombia. Ph.D. Thesis. Facultad de Agronomia, Universidad Nacional, Bogota. 130 pp.

7. APROVED

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D.S. Douches, Chairman, Technical Committee Date

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R.L. Lower, Lead Administrative Advisor Date