

# ANNUAL REPORT

Calendar Year 2001

## 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	Chairman (2002)	J. C. Miller, Jr.
Western Region	Vice Chair (2002)	A. R. Mosley
North Central Region		D. S. Douches
North Eastern Region		

### United States Department of Agriculture

Agricultural Research Service		
Technical Representative	Secretary (2002)	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	P. W. Ludden
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. Bamberg, accompanied by Charles Fernandez (US Potato Genebank), participated in a successful expedition to the southwest United States and obtained ten new accessions for the collaborative intergenebank research project.

A total of 34 seed accessions were assigned PI numbers in 2001: 13 from Russia, 10 from Peru, 1 from Mexico, and 10 from the SW United States. 51 clonal accessions were assigned PI numbers in 2001, 3 from Mexico, 18 from Peru, 9 from Poland, and 20 from Sweden. These accessions are now available from the NRSP-6 *Solanum* germplasm collection.

#### **B. Preservation and Increase of Stocks**

In 2001, 91 accessions were increased as botanical seed populations.

This year a total of 900 potato spindle tuber viroid (PSTV) tests were performed on seed increase parents, seed lots and research materials. Germination tests were performed on 1400 accessions; ploidy determinations were made on 325 accessions.

After last year's limited success with spraying of 2,4-D on pollinated flowers to help in fruit retention and seed production, different chemicals are being studied to produce increased flowering and increased tuber initiation and production on wild potato species.

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 now being managed by Robert Hijmans at CIP ([www.potgenebank.org/ipd/](http://www.potgenebank.org/ipd/)) and continues to be a very useful resource for clientele around the world.

#### **C. Classification**

Dr. Spooner continues to resolve problems in taxonomic classification, which impede both efficient documentation and use of the germplasm. At present Dr. Spooner, in collaboration with Dr. R van den Berg, Dr. R. Hijmans, and Dr. A. Rodriguez, is working on a book of Wild Potato Species of North and Central America, which will be a valuable tool for germplasm users world wide.

## **D. Distribution**

NRSP-6 distributed 6,099 units of seed, 302 tuber families and 1,214 in vitro stocks to clientele in 20 states of the United States and 15 other countries. Internally, NRSP-6 used 4,061 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

Category	Units <sup>1</sup>					PIs
	S	TF	IVS	FSG	TOTAL	
Domestic	5,553	302	1142	472	7,469	5,994
Foreign	546	0	55	80	681	612
NRSP-6 <sup>2</sup>	4,061	0	17	0	4,078	1,571
<b>Total</b>	<b>10,160</b>	<b>302</b>	<b>1,214</b>	<b>552</b>	<b>12,228</b>	<b>8,177</b>

<sup>1</sup> 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).

<sup>2</sup> 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

Breeding and genetic stocks were tested in Mexico; in addition, an inoculated test plot was initiated in an isolated field near the genebank.

#### 2. Antioxidant Screening

A cooperative agreement was initiated with colleagues in Texas to test exotic species for high tuber antioxidants. Species found to be promising in preliminary tests became the subject of more focused testing this year.

#### 3. Glycoalkaloid Screening

Tuber and leaf samples from families previously identified as having a combination of very high leaf and very low tuber glycoalkaloids were produced. The present focus is on testing a greater number of individuals from a segregating family and intermating the best selected clones for recurrent selection for maximum leaf : tuber ratio.

#### 4. Cold Genetics, Breeding and Physiology

Recurrent selection for good tuber characteristics in hybrids of *tuberosum* with extremely cold hardy species was continued. A homemade freezing apparatus was used to test leaves from hundreds of segregating field-grown plants. Some of these show great improvement in cold hardiness combined with good tuber type and earliness.

#### 5. Tuber Calcium Accumulation

The segregation of an interspecific family between parents with extremely different abilities of accumulating tuber calcium when low levels are available from the soil was tested.

#### 6. Hormone Mutants

Plants carrying the *gal* mutant for response to exogenous GA3 in vitro were tested. The mutant responds differently in different genetic backgrounds, suggesting some minor modifying genes may also be operating.

7. Apomixis. DNA markers show preliminary evidence to support apomixis suspected in certain *S. jamesii* populations. These preliminary results could have great application in potato breeding and germplasm preservation and could reveal *in situ* population dynamics that impact collecting.

### **F. Inter-genebank Collaboration**

The Association of Potato Inter-genebank Collaborators (APIC) was formed in 1991 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. Reputed duplicates in US and CIP (Peru) genebank with RAPDs. Significant differences were less common than in previous comparisons between the VIR (Russian) and US genebanks. A collaboration with VIR on nematode screening of *S. andigena* accessions held at both genebanks was accomplished creating the possibility of comparing the presence of a practical trait in reputed duplicates in the two genebanks.

#### 2. Import of rescued seeds from Poland.

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) were imported. Multiplication of these accessions has been initiated at the genebank.

#### 3. Collecting native US wild potatoes.

Collection continued at Southwest sites missed in previous expeditions. Among the notable results of this trip, was the discovery of *S. jamesii* germplasm from a county in New Mexico from which wild potato has never been previously reported.

### **G. Visitors From Other Countries**

Dr. Y. Chen	Taiwan
Dr. W. Roca	Peru
Dr. S. Kiru	Russia
Dr. R. van den Berg	Netherlands
Dr. A. Rodriguez	Mexico

## **4. USEFULNESS OF FINDINGS**

NRSP-6's purpose is to provide a ready source of raw materials, technology and information to, 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.

Eleven cultivar releases were published in the American Journal of Potato Research in 2001: 'AC Peregrine Red', 'AC Glacier Chip', 'AC Maple Gold', 'Amey', 'Eva', 'Jacqueline Lee', 'Klamath Russet', 'Liberator', 'Mazama', 'Michigan Purple', and 'Winema'. All are known to have wild species in their pedigrees.

Section 6 lists 111 papers, 32 abstracts, and 5 theses which report the use of NRSP-6 *Solanum* introductions this year.

## **5. WORK PLANNED FOR 2002**

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 is 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.

APIC inter-genebank projects researching the status and dynamics of genetic diversity in the collection using RAPDs and strengthening ties with sister genebanks around the world will be continued.

## **6. PUBLICATIONS ISSUED DURING THE YEAR**

### **A. Publications issued by NRSP-6 Personnel**

- Bamberg, J.B., S.D. Kiru and A.H. del Rio. 2001. Comparison of reputed duplicate populations in the Russian and US potato genebanks using RAPD markers. *Am. J. Potato Res.* 78:365-369.
- Bamberg, J.B., S. Love and D. Corsini. 2001. Fine screening potato germplasm for high leaf and low tuber glycoalkaloids. *Am. J. Potato Res.* 78:443. (Abstract)
- del Rio, A.H. and J.B. Bamberg. 2001. Genetic heterogeneity among breeding systems of potato species and its ramifications in germplasm conservation. *Am. J. Potato Res.* 78:452-453. (Abstract)
- del Rio, A.H., J.B. Bamberg, Z. Huaman, A. Salas, and S.E. Vega. 2001. Association of ecogeographical variables and genetic variation in native wild US potato populations determined by RAPD markers. *Crop Science* 41:870-878.
- Douches, D.S., J.B. Bamberg, W. Kirk, K. Jastrzebski, B.A. Niemira, J. Coombs, D.A. Biognin, and K.J. Fletcher. 2001. Evaluation of wild *Solanum* species for resistance to the US-8 genotype of *Phytophthora infestans* utilizing a fine-screening technique. *Am. J. Potato Res.* 78:159-165.
- Hale, Anna L., L. Cisneros-Zevallos, John B. Bamberg, and J. Creighton Miller, Jr. 2001. Identification of named varieties, advanced selections and accessions with high antioxidant activity for use in breeding potatoes for enhanced human health benefits. *Am. J. Potato Res.* 78:455-456. (Abstract)
- Kiru, S., S. Makovskaya and J. Bamberg. 2001. Resistance of *Solanum andigenum* accessions maintained at VIR and US potato genebanks to Golden Nematode. *Am. J. Potato Res.* 78:463. (Abstract)
- Lara-Cabrera, Sabina I. and David M. Spooner. 2001. Taxonomy of Mexican diploid wild potato (*Solanum* sect. *Petota*) species: morphological and microsatellite data. *Am. J. Potato Res.* 78:465-466. (Abstract)
- Hijmans, R. and D.M. Spooner. 2001. Geographic distribution of wild potato species. *Amer. J. Bot.* 88:2101-2122.
- Peralta, E. and D.M. Spooner. 2001. GBSSI Gene Phylogeny of Wild Tomatoes (*Solanum* L. section *Lycopersicon* [Mill.] Wettst. Subsection *Lycopersicon*). *Amer. J. Bot.* 88:1888-1902.
- Salas, A.R., D.M. Spooner, Z. Huaman, R.V. Torres-Maita, R. Hoekstra, K. Schuler, and R.J. Hijmans. 2001. Taxonomy and new collections of wild potato species in central and southern Peru in 1999. *Am. J. Potato Res.* 78:197-207.

- Spooner, D.M. 2001. Potato. Encyclopedia of plant sciences, Ed. Richard Robinson, pp. 184-185. Macmillan Reference USA, Gale Group, Farmington Hills, MI.
- Spooner, D.M. and R. Hijmans. 2001. Potato systematics and germplasm collecting, 1989-2000. *Am. J. Potato Res.* 78:237-268; 395.
- Spooner, D.M., R. Hoekstra and B. Vilchez. 2001. *Solanum* sect. *Petota* in Costa Rica: taxonomy and genetic resources. *Am. J. Potato Res.* 78:91-98.
- Spooner, D. and S. Lara-Cabrera. 2001. Sistemática molecular y evolución de plantas cultivadas. In: H.M. Hernandez, A. Garcia-Aldrete, F. Alvarez & M. Ulloa. (Eds.). *Enfoques Contemporáneos para el Estudio de la Biodiversidad*. Instituto de Biología, UNAM/Fondo de Cultura Económica, Mexico, pp. 57-114.
- Spooner, D.M., A. Salas and R. Hijmans. 2001. Wild potato germplasm collecting expedition to Honduras and Panama. *Am. J. Potato Res.* 78:485. (Abstract)
- Spooner, D.M. and R.G. van den Berg. 2001. Quantitative assessment of corolla shape variation in Mexican *Solanum* sect. *Petota*. Pp. 61-71 In: van den Berg, R.G., G. Barendse, G.W. van der Weerden, and C. Mariani, (eds.). *Solanaceae V: Progress in taxonomy and utilization*. Nijmegen Univ. Press, Nijmegen, The Netherlands.
- Spooner, D.M., R.G. van den Berg and J.T. Miller. 2001. Species and series boundaries of *Solanum* series *Longipedicellata* (Solanaceae) and phonetically similar species in ser. *Demissa* and ser. *Tuberosa*: implications for a practical taxonomy of sect. *Petota*. *Amer. J. Bot.* 88:113-130.
- Spooner, D.M., R.G. van den Berg, A. Rivera-Pena, P. Velguth, A. del Rio, and A. Salas. 2001. Taxonomy of Mexican and Central American members of *Solanum* Series *Conicibaccata* (sect. *Petota*) *Syst. Bot.* 26:743-756.
- van den Berg, R.G., N. Groendijk-Wilders, M.J. Zevenbergen, and D.M. Spooner. 2001. Molecular systematics of *Solanum* series *Circaeifolia* (*Solanum* section *Petota*) based on AFLP and RAPD markers. Pp. 72-84 In: van den Berg, R.G., G. Barendse, G.W. van der Weerden, and C. Mariani, (eds.). *Solanaceae V: Progress in taxonomy and utilization*. Nijmegen Univ. Press, Nijmegen, The Netherlands.

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

- Anusuya Rangarajan, A.R. Miller and R.E. Veilleux. 2000. Leptine glycoalkaloids reduce feeding by Colorado potato beetle in diploid *Solanum* sp. hybrids. *J. Am. Soc. Hort. Sci.* 125(6):689-693.
- Ashkenazi, V.E. Chani, U. Lavi, D. Levy, J. Hillel, and R.E. Veilleux. 2001. Development of microsatellite markers in potato and their use in phylogenetic and fingerprinting analyses. *Genome* 44:50-62.

- Bachem, C.W.B., B. Horvath, L. Trindade, M. Claassens, E. Davelaar, W. Jordi, and R.G.F. Visser. 2001. A potato tuber-expressed mRNA with homology to steroid dehydrogenases affects gibberellin levels and plant development. *Plant J.* 25(6):595-604.
- Barone, A., A. Sebastiano, D. Carputo, F. Della Rocca, and L. Frusciante. 2001. Molecular marker-assisted introgression of the wild *Solanum commersonii* genome into the cultivated *S. tuberosum* gene pool. *Theor. Appl. Genet.* 102(6/7):900-907.
- Bastia, T., N. Carotenuto, B. Basile, A. Zoina, and T. Cardi. 2000. Induction of novel organelle DNA variation and transfer of resistance to frost and *Verticillium* wilt in *Solanum tuberosum* through somatic hybridization with 1EBN *S. commersonii*. *Euphytica* 116(1):1-10.
- Bastia, T., N. Scotti and T. Cardi. 2001. Organelle DNA analysis of *Solanum* and *Brassica* somatic hybrids by PCR with 'universal primers'. *Theor. Appl. Genet.* 102(8):1265-1272.
- Beek, J.G. van der, P.W.T. Maas, G.J.W. Janssen, C. Zijlstra, and C.H. van Silfhout. 1999. A pathotype system to describe intraspecific variation in pathogenicity of *Meloidogyne chitwoodi*. *J. Nematology* 31(4):386-392.
- Bink, M.C.A.M., P. Uimari, M.J. Sillanpaa, L.L.G. Janss, and R.C. Jansen. 2001. Application of multiple QTL mapping in complex plant crosses to partial resistance to late blight (*Phytophthora infestans*) in potato: better insight by using a design-independent method. In *Quantitative genetics and breeding methods: the way ahead. Proc. of 11<sup>th</sup> Mtg. of EUCARPIA Sec. Biometrics in Plant Breeding, Paris, France, 8/30-9/1/00.* [A. Gallais, C. Dillmann, I. Goldringer, (eds.)]
- Bisognin, Dilson, Lynn Buszka and David Douches. 2001. Mapping late blight resistance and other agronomic traits in a *S. microdontum* population. *Am. J. Potato Res.* 78:444. (Abstract)
- Bradeen, James M., S. Kristine Naess, Susan M. Wielgus, Jeffrey A. Davis, Geraldine T. Haberlach, and John P. Helgeson. 2001. Cloning late blight resistance from *Solanum bulbocastanum*. *Am. J. Potato Res.* 78:445. (Abstract)
- Brodie, B.B. 1998. Potato. In: *Plant and nematode interactions* [K.R. Barker, G.A. Pederson, G.L. Windham, (eds.)]. *Am. Soc. Agronomy, Madison, USA.*
- Brown, C.R., H. Mojtahedi and G.S. Santo. 1999. Genetic analysis of resistance to *Meloidogyne chitwoodi* introgressed from *Solanum hougasii* into cultivated potato. *J. Nematology* 31(3):264-271.
- Carputo, D., A. Barone and L. Frusciante. 2000. 2n gametes in the potato: essential ingredients for breeding and germplasm transfer. *Theor. Appl. Genet.* 101(5/6):805-813.



- Carputo, D., B. Basile, T. Cardi, and L. Frusciante. 2000. *Erwinia* resistance in backcross progenies of *Solanum tuberosum* x *S. tarijense* and *S. tuberosum* (+) *S. commersonii* hybrids. *Potato Res.* 43(2):135-142.
- Carrasco, A., J.I. Ruiz de Galarreta, A. Rico, and E. Ritter. 2000. Transfer of PLRV resistance from *Solanum verrucosum* Schlecht to potato (*S. tuberosum* L.) by protoplast electrofusion. *Potato Res.* 43(1):31-42.
- Christ, B.J. 2001. Powdery Scab: An emerging disease on potato. *Am. J. Potato Res.* 78:447-448. (Abstract)
- Christ, B.J. and K.G. Haynes. 2001. Inheritance of resistance to early blight disease in a diploid potato population. *Plant Breeding* 120(2):169-172.
- Collins, W. 2000. Research strategies for potatoes: a global approach. In World Potato Congress: Proc. of Fourth World Potato Congress, Amsterdam, The Netherlands, Sept. 4-6, 2000. Wageningen, Netherlands; Wageningen Pers 209-214.
- Coombs, Joseph, David Douches, Edward Grafius, Walter Pett, and Dale Moyer. 2001. Field evaluation of natural and engineered potato (*Solanum tuberosum* L.) resistance mechanisms for control of Colorado potato beetle (*Leptinotarsa decemlineata* Say). *Am. J. Potato Res.* 78:448-449. (Abstract)
- Corsini, Dennis, Richard Novy, Annie Marshall, and Joseph Pavsek. 2001. Protein levels in potato breeding selections and cultivars. *Am. J. Potato Res.* 78:449. (Abstract)
- Debnath, M.C., J.N. Khaund, B.K. Bora, and P.C. Sarmah. 2000. The reaction of host plants on the biology of potato tuber moth, *Phthorimaea operculella* (Zeller). *Res. On Crops* 1(2):196-200.
- DeJong, H., K.G. Proudfoot and A.M. Murphy. 2001. The germplasm release of F87084, a fertile, adapted clone with multiple disease resistances. *Am. J. Potato Res.* 78:141-149.
- DeJong, H., L.M. Kalwchuk, W.K. Coleman, C.A. Verhaeghe, L. Russell, V.J. Burns, and E. Tremblay-Deveau. 2001. Development and characterization of an adapted form of *Droopy*, a diploid potato mutant deficient in abscisic acid. *Am. J. Potato Res.* 78:279-290.
- DeJong, H., L.M. Kawchuk, W.K. Coleman, C.A. Verhaeghe, L. Russell, V.J. Burns, and E. Tremblay-Deveau. 2001. Development and characterization of an adapted form of *Droopy*, a diploid potato mutant deficient in abscisic acid. *Am. J. Potato Res.* 78:451. (Abstract)
- Derie, M.L. and D.A. Inglis. 2001. Persistence of complex virulences in populations of *Phytophthora infestans* in Western Washington. *Phytopathology* 91(6):606-612.

- Devine, K.J. and P.W. Jones. 2001. Potato cyst nematode hatching activity and hatching factors in inter-specific *Solanum* hybrids. *Nematology* 3(2):141-149.
- Dong, F., J. Song, S.K. Naess, J.P. Helgeson, C. Gebhardt, and J. Jiang. 2000. Development and applications of a set of chromosome-specific cytogenetic DNA markers in potato. *Theor. Appl. Genet.* 101(7):1001-1007.
- Dong, F., J.M. McGrath, J.P. Helgeson, and J. Jiang. 2001. The genetic identity of alien chromosomes in potato breeding lines revealed by sequential GISH and FISH analyses using chromosome-specific cytogenetic DNA markers. *Genome* 44:729-734.
- Dorrance, A.E., D.A. Inglis, J.P. Helgeson, and C.R. Brown. 2001. Partial Resistance to *Phytophthora infestans* in Four *Solanum* Crosses. *Am. J. Potato Res.* 78:9-17.
- Douches, D.S., K. Jastrzebski, J. Coombs, W.W. Kirk, K.J. Felcher, R. Hammerschmidt, and R.W. Chase. 2001. Jacqueline Lee: A late-blight-resistant tablestock variety. *Am. J. Potato Res.* 78:413-419.
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- Douches, D.S., K. Jastrzebski, J. Coombs, R.W. Chase, R. Hammerschmidt, and W.W. Kirk. 2001. Liberator: A round white chip-processing variety with resistance to scab. *Am. J. Potato Res.* 78:425-431.
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- Estrada, N., C.E. Nustez and Sonia Tinjaca. 2001. La biodiversidad en el mejoramiento de la Papa I-Resistencia de la papa a la "gota" causada por el *Phytophthora infestans*. Experiencias y avances en su hibridacion en Colombia. Memorias VIII Reunion de la Sociedad Colombiana de Fitomejoramiento y Produccion de Cultivos-Ibague, Colombia.
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- Eusebio, J.E. and E.N. Bernardo. 1999. Techniques of potato germplasm evaluation for broad mite (*Polyphagotarsonemus latus* (Banks)) resistance. *Philippine Entomologist* 13(1):35-41.
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- Gao Gang, Qu DongYu, Lian Yong, Jin LiPing, and Feng LanXiang. 2000. Identification molecular markers linked with resistance to bacterial wilt (*Ralstonia solanacearum*) in diploid potato. *Acta Hort. Sinica* 27(1):37-41.
- Gavrilenko, T., R. Rhieme and V.M. Rokka. 2001. Cytogenetic analysis of *Lycopersicon esculentum* (+) *Solanum etuberosum* somatic hybrids and their androgenetic regenerants. *Theor. Appl. Genet.* 103(2/3):231-239.
- Ghislain, M., B. Trognitz, M. del R. Herrera, J. Solis, G. Casallo, C. Vasquez, O. Hurtado, R. Castillo, L. Portal, and M. Orrillo. 2001. Genetic loci associated with field resistance to late blight in offspring of *Solanum phureja* and *S. tuberosum* grown under short-day conditions. *Theor. Appl. Genet.* 103(2/3):433-442.
- Hamernik, A.J., J. Havey and R.E. Hanneman, Jr. 2001. Wild species, nature's treasure to potato improvement. *Proceedings of Wisconsin's Annual Potato meetings 2001.*
- Hamernik, A.J., M. Ramon and R.E. Hanneman, Jr. 2001. Modified conventional breeding methods to efficiently transfer unique late blight resistance from 2x(1EBN) Mexican species to 2x(2EBN) and 4x(4EBN) breeding lines. *Am. J. Potato Res.* 78:456. (Abstract)
- Hanneman, R.E. Jr., A.J. Hamernik and M.J. Havey. 2001. Evaluation of parental materials and enhancement selections for resistance to late blight, Colorado Potato Beetle, early dying and scab in field tests at the UW Agricultural Research Station, Hancock, Wisconsin. K.G. Haynes (ed.). *National Potato Germplasm Evaluation and Enhancement Report, 2000.* USDA, ARS, Beltsville, Maryland.
- Harding, K. and S. Millam. 2000. Analysis of chromatin, nuclear DNA and organelle composition in somatic hybrids between *Solanum tuberosum* and *Solanum sanctae-rosae*. *Theor. Appl. Genet.* 101(5/6):939-947.
- Hayes, Ryan J. and C.A. Thill. 2001. Identification of 4C chipping in 12 late blight resistance *Solanum* species. *Am. J. Potato Res.* 78:457. (Abstract)
- Hayes, Ryan J. and C.A. Thill. 2001. Co-current introgression of economically important traits in a potato breeding program. *Am. J. Potato Res.* (In press).

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## **7. APPROVED**

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J. C. Miller, Jr., Chairman, Technical Committee

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Date

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P. W. Ludden, Lead Administrative Advisor

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Date