ANNUAL REPORT

Calendar Year 1995

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

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

2. COOPERATIVE AGENCIES AND PRINCIPAL LEADERS

State Agricultural Experimental Stations	**Representative**
North Central Region	F. I. Lauer
Western Region	A. R. Mosley
Southern Region	J. C. Miller, Jr.
North Eastern Region	A. F. Reeves

United States Department of Agriculture

Agricultural Research Service	
Technical Representative	J. J. Pavek
National Program Staff	H. L. Shands
Area Director, Midwest Area	R. L. Dunkle
Cooperative States Research Service	C. Stushnoff
Animal and Plant Health Inspection Service	A. T. Tschanz
Inter-Regional Potato Introduction Project	J. B. Bamberg

Agriculture Canada T. R. Tarn

Administrative Advisors

North Central Region, Chairman	R. L. Lower
Western Region	V. V. Volk
Southern Region	E. Young
North Eastern Region	R. C. Seem

3. PROGRESS AND PRINCIPAL ACCOMPLISHMENTS

A. Introduction of New Stocks

A total of 78 new accessions were collected in 1995 from Guatemala, Mexico, and United States.

Dr. Spooner, in collaboration with Dr. V. Martinez (Guatemala), Dr. R. Hoekstra (The Netherlands) and Dr. R. van den Berg (The Netherlands), participated in an expedition to collect wild species of potato in Guatemala, from September 11th to November 5th 1995. This collection trip procured 44 new accessions and 38 herbarium specimens, nearly quadrupling the available wild potato germplasm from Guatemala.

Dr. Bamberg collected 27 accessions from New Mexico and Arizona in a five day collection trip in September 1995. This work is part of the intergenebank research project to investigate genetic drift in nature versus genebank maintenance (see Inter-genebank Collaboration page 5).

Dr. P. Hjerting of The Netherlands spent two weeks in late October 1995 collecting seven accessions of wild potatoes in Mexico and has donated these accessions to NRSP-6.

B. Preservation and Increase of Stocks

In 1995, 163 accessions were increased. One hundred accessions were received from U.S. Quarantine for a joint seed increase and quarantine virus testing at NRSP-6 in 1995, and 22 accessions were retested because they failed to pass quarantine in 1994. Of the 122 accessions, 68 failed to germinate, 5 were not released by quarantine and 49 are being incorporated into the NRSP-6 inventory.

There were 92 new PI numbers assigned in 1995: 38 from the 1994 joint seed increase with CIP, 27 from Dr. Bamberg's 1995 collection from SW United States, 15 from Dr. Spooner's 1994 collection trip in South America and 12 accessions from previous expeditions.

This year a total of 930 potato spindle tuber viroid (PSTV) tests were performed on seed increases, seed lots and research materials. Germination tests were performed on 1,296 accessions. Many accessions were concurrently used for PSTV testing of new seedlots, field plantings for testing seedlot purity, or research plantings.

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 of the *S. brevicaule* complex of species was initiated. Insights gained from this study will allow accessions to be assigned stable species' names based on empirical differences. Because Mexican species are a rich source of late blight resistance, investigations into the taxonomic relationships of these species were also accelerated to provide information for more rational use of these stocks by breeders.

D. Distribution

NRSP-6 distributed 10,792 units of seed (50 seeds per unit), 157 tuber families and 487 in vitro stocks to clientele in 20 states of the United States and 27 other countries. Internally, NRSP-6 used 18,800 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	TOTAL	PI'S
Domestic	4,127	157	417	4,701	3,312
Foreign	6,665[3]	0	70	6,735	1,432
NRSP-6[2]	18,800	0	0	18,800	1,523
Total	29,592	157	487	30,236	6,267

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).

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

3 Includes 2,480 units to Chile and 1,257 units to Argentina, as agreed in the collection agreement to provide 2,000 seeds of all accessions collected in the cooperating country.

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. Tuber Traits

Wild species do not produce tubers in the long days of North American summers, so their tuber traits cannot be assessed in the field. A project was initiated in 1993 in which wild accessions are being systematically crossed with adapted (cultivated) forms to produce F_2 true seed families. This moved the potential valuable tuber traits of species to a background in which they can be revealed. In the fall of 1994 the first tubers from our F_2 tuber traits project were harvested from the field. In 1995 we continue to produce the F_1 and F_2 seed lots for other accessions in the tuber traits project, and will advertise these to our cooperators as they become available.

2. Frost Hardiness

Work was continued on frost hardiness: New sources of hardiness and breeding combinations exhibited outstanding frost resistance. Crosses were made in 1995 to improve earliness. Evidence of interspecific variation for speed of cold acclimation and deacclimation among wild species was found.

3. Tuber Calcium

Progress was made on a stepwise "fine screening" program identifying species, then accessions within species, then individuals within accessions with outstanding ability to accumulate tuber calcium. This trait has been shown to be closely associated with resistance to important storage rots and other tuber quality traits. These materials will be powerful tools for studying physiology and genetics of the trait and for use in breeding.

4. Colorado Potato Beetle

The CPB project continues to examine the intra-population variation for various parameters of CPB resistance. Significant intra-accession variation was found for every parameter, even in extremely resistant families. The resistant clones within accessions were intermated and seedlots nearly pure for “ultra-resistance” were identified.

5. Glycoalkaloids

A spectrum of species were evaluated for leaf and tuber glycoalkaloids. Accessions with reputed high resistance to Colorado potato beetle and high foliar glycoalkaloids (not leptines in *chacoense*) were deliberately chosen. Some accessions had as much as 18 times the TGA in leaves as tubers. These materials will be further investigated in hopes of finding and characterizing new genetic systems for controlling tissue specificity of anti-bug glycoalkaloids.

6. Root Mass and Nutrient Uptake

A working aeroponic system was developed and calibrated for potato cultivars to assess root parameters that may be valuable for breeding. We are now screening a preliminary sample of *Solanum* germplasm and will eventually screen the entire mini-core collection. This research will provide the first precise characterization of the diversity available in potato germplasm with respect to root mass and nutrient uptake.

7. Nitrogen-use Efficiency

In 1994 a mini-core collection of 39 wild potato species was evaluated for nitrogen use efficiency given low and high nitrogen applications. In 1995 we crossed the most efficient and inefficient nitrogen accumulators at both high and low nitrogen levels with USW 551, a haploid of Chippewa. In comparing the wild species hybrids to cultivated varieties, it was found that the varieties were average, with the wild species hybrids occupying both the high and low positions for nitrogen use efficiency at both high and low nitrogen levels. This research demonstrates wild *Solanum* species may have great value in breeding for improved nitrogen use efficiency.

8. Bee Pollinations

The seed lots produced in the bee cages in 1994 were evaluated for seed purity and found indistinguishable from the original seed lots. In 1995 we planted out three noncompatible accessions in each of the two bee cages. We often observe very high fruit set in field plantings and wondered if it was due to wind, spontaneous fruiting ,or insects. Plants were maintained in the cages and evaluated for fruiting. No fruit were produced on all 120 plants maintained in the bee cages, so... (all caged fruit are due to bees).

9. Characterization for Utility Traits

The success of using *Solanum* germplasm for breeding is influenced by relative plant vigor, flowering, pollen shed and pollen viability. Relative scores for these parameters were published in the *Elite Selections*... publication. Characterization of the collection for these traits continued in 1995.

10. Late Blight Screening

New forms of the late blight pathogen have developed into a severe threat to the US potato crop. In 1995 we had three cooperative screening projects: 1) BC, Canada with Dr. Ormrod; 2) Cornell, New York with Dr. Fry and 3) Toluca, Mexico with Dr. Lozoya-Saldana. Previous screening of germplasm suggested that high levels of resistance exist among wild species. Some materials previously suspected to be resistant were susceptible, and some materials not previously confirmed as resistant were extremely resistant.

F. Inter-genebank Collaboration

The sixth meeting of the Association of Potato Inter-genebank Collaborators (APIC) was organized in Bangor, Maine. A world-wide database of wild potato germplasm with evaluation data was completed. These activities significantly increased the quality and the quantity of genetic resources available to US scientists for the improvement of the potato crop.

Dr. Bamberg reported on the joint APIC research project to measure genetic diversity in two model wild potato species. The goal is to use RAPDs to provide answers to questions critical to genebank management: 1) Have accessions lost genetic diversity over several generations of sib-mating in the genebank? 2) Are samples in the genebank collected decades ago still equivalent to a population from the same site in the wild? 3) What geophysical factors best explain patterns of diversity found among collection sites?

When comparing seedlots of successive sibmated increases of an accession, results now indicate that <5% genetic diversity per generation has been lost. Thus we consider techniques in practice at the genebank to have been effective. Recollected populations in the wild are significantly different from gene bank samples originally collected decades previously.

APIC representatives Dr. S. Kiru from VIR (Russia) and Dr. K. Schuler from GLKS (Germany) both visited NRSP-6 for six days following the meeting. This was a great opportunity for the NRSP-6 staff to exchange ideas and techniques with their foreign counterparts on *Solanum* germplasm maintenance problems.

G. Visitors from Other Countries

Dr. Peter Hjerting, Copenhagen, Denmark
Dr. Stepan Kiru, St. Petersburg, Russia
Dr. Daniel Nieto, Toluca, Mexico
Dr. Zsolt Polgar, Keszthely, Hungry
Dr. Konrad Schuler, Gross Lusewitz, Germany
Dr. Vadim Molodkin, St. Petersburg, Russia
Mr. Tommi Vippola, Helsinki, Finland

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.

Six cultivar releases were published in the American Potato Journal in 1995: 'Amisk', 'A.C. Belmont', 'A.C. Brador', 'A.C. Chaleur', 'A.C. Novachip', and 'Portage'. All are known to have wild species' introductions in their pedigrees.

Section 6 lists 101 papers, 26 abstracts, and 4 theses reporting the use of NRSP-6 *Solanum* introductions this year.

5. WORK PLANNED FOR 1996

Dr. Spooner will participate in a collecting expedition to Costa Rica in 1996.

Evaluation experiments will be continued on *Solanum* species for the following traits: Nitrogen-use efficiency, frost tolerance, rooting vigor, tuber calcium, tuber and foliar glycoalkaloids, late blight, and Rhizoctonia.

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 intergenebank research projects determining the cause of observed differences *in situ* and genebank accessions, and correlations of geographic/habitat data with partitioning of diversity.

6. PUBLICATIONS ISSUED DURING THE YEAR

A. Publications issued by NRSP-6 Personnel

Bamberg, J. B., J. P. Palta, L. A. Peterson, Max Martin, and A. R. Krueger. 1995. Screening potato species germplasm for tuber calcium. Am Potato J 72(10):613. (Abstract)

Bamberg, J. B., Z. Huaman, and R. Hoekstra. 1995. International Cooperation in Potato Germplasm. Crop Sci Soc Am 23:177-182.

Bamberg, John B. 1995. Screening potato (*Solanum*) species for male fertility under heat stress. Am Potato J 72(1):23-33.

Contreras-M., A. and D. M. Spooner. In press. Revision of *Solanum* section *Etuberosum*. In: M. Nee, D. E. Symon, J. P. Jessop (eds.). Solanaceae IV: taxonomy, chemistry, evolution, Royal Botanic Gardens, Kew.

Kleinhenz, Matthew D., John B. Bamberg, and Jiwan P. Palta. 1995. Use of stomatal index as a marker to screen backcross populations of two wild potato species segregating for freezing tolerance. Am Potato J 72(4):243-250.

Miller, Joseph T. and David M. Spooner. 1995. Reinvestigation of the *Solanum chacoense/S. microdontum* hybridization hypothesis. Am Potato J 72(10):642. (Abstract)

Palta, J. P., L. S. Weiss, J. F. Harbage, J. B. Bamberg, and J. M. Stone. 1993. Molecular mechanisms of freeze-thaw injury and cold acclimation in herbacious plants: merging physiological and genetic approaches. In: Interacting stresses on plants in a changing climate (M. B. Jackson and C. R. Black, Eds.). Berlin, Germany; Springer-Verlag 659-680.

Rodriguez, A., O. Vargas, E. Villegas, and D. M. Spooner. 1995. Wild potato (*Solanum* sect. *Petota*) germplasm collecting expedition to Mexico in 1993, with special reference to *Solanum bulbocastanum* Dunal and *S. cardiophyllum* Lindley. Potato Res 38:47-52.

Spooner, David M. 1994. Molecular and morphological methods for characterization of germplasm diversity and systematic relationships in wild potatoes (*Solanum* sect. *Petota*). VI Latin American Botanical Congress, Mar del Plata, Argentina, Abstracts: 10. (Abstract)

Spooner, David M. and A. Contreras-M. 1994. Revision of *Solanum* series *Etuberosum*. IV International Solanaceae Symposium, Adelaide, Australia, Abstracts: 7. (Abstract)

Spooner, David M., J. Tivang, J. Nienhuis, J. P. Miller, D. S. Douches, and A. Contreras-M. 1995. Comparison of four molecular markers in measuring relationships among the wild potato relatives *Solanum* section *Etuberosum* (subgenus *Potatoe*). Theor Appl Genet 82:In press.

Spooner, David M., Jan Tivang, James Nienhuis, Joseph P. Miller, David S. Douches, and A Contreras M. 1995. Comparison of four molecular markers in measuring relationships among *Solanum* section *Etuberosum* (subgenus *Potatoe*). Am Potato J 72(10):657. (Abstract)

Spooner, David M., R. Castillo T., L. Lopez J., R. Pineda, R. Leon P., A. Vargas, M. L. Garcia, and J. B. Bamberg. 1995. Colombia and Venezuela 1992 wild potato (*Solanum* sect. *Petota*) germplasm collecting expedition: taxonomy and new germplasm resources. Euphytica 81:45-56.

Spooner, David M., R. G. van den Berg, and J. B. Bamberg. 1995. Examination of species boundaries of *Solanum* series *Demissa* and potentially related species in ser. *Acaulia* and series *Tuberosa* (sect. *Petota*). Syst Bot 20:293-314.

Spooner, David M., R. G. van den Berg, W. Garcia, and M. L. Ugarte. 1994. Bolivia potato germplasm collecting expeditions 1993, 1994: taxonomy and new germplasm resources. Euphytica 79:137-148.

Vega, S. E. and J. B. Bamberg. 1995. Screening the U.S. potato collection for frost hardiness. Am Potato J 72(1):13-21.

Vega-Semorile, Sandra E., J. B. Bamberg, and Jiwan P. Palta. 1995. Variation in the speed of cold acclimation among wild tuber-bearing potato (*Solanum*) species. Am Potato J 72(10):664. (Abstract)

Watanabe, K. N., M. Orrillo, S. Vega, J. P. T. Valkonen, E. Pehu, A. Hurtado, and S. D. Tanksley. 1995. Overcoming crossing barriers between nontuber-bearing and tuber-bearing *Solanum* species: towards potato germplasm enhancement with a broad spectrum of solanaceous genetic resources. Genome 38(1):27-35.

B. Journal Articles and Abstracts Reporting Research with NRSP-6 Stocks
(Note: Publications from previous years are included if missed in previous annual reports.)

Al-Saikhan, M. S., L R. Howard, and J. C. Miller, Jr. 1995. Antioxidant activity and total phenolic content in different genotypes of potato (*Solanum tuberosum*, L.). J Food Sci 60:341-347.

Arihara, Akihiro, Tomoyuki Kita, Satoshi Igarashi, Masanori Goto, and Yukio Irikura. 1995. White Baron: A non-browning somaclonal variant of Danshakuimo (Irish Cobbler). Am Potato J 72(11):701-705.

Bacchetta, L. and A. Sonnino. 1994. Evaluation of characters related to Colorado potato beetle (CPB) resistance in *Solanum berthaultii* x *S. tuberosum* derived progenies. J Genet & Breed 48(3):269-275.

Backund, Jan Erik and Florian I. Lauder. 1995. Parthenocarpy and parthenogenesis in a *Solanum phureja* x *S. stenotomum* population. Am Potato J 72(10):612. (Abstract)

Barone, A., C. Gebhardt, and L. Frusciante. 1995. Heterozygosity in 2n gametes of potato evaluated by RFLP markers. Theor Appl Genet 91(1):98-104.

Birhman, R. K., G. Laublin, and M. Cappadocia. 1994. Genetic control of *in vitro* shoot regeneration from leaf explants in *Solanum chacoense* Bitt. Theor Appl Genet 88(5):535-540.

Birhman, R. K., G. Laublin, and M. Cappadocia. 1994. Inheritance of a lethal yellow-cotyledon seedling mutant in *Solanum chacoense* Bitt. J Heredity 85(3):241-242.

Birhman, R. K., S. R. Rivard, and M. Cappadocia. 1994. Restriction fragment length polymorphism analysis of anther-culture-derived *Solanum chacoense*. HortSci 29(3):206-208.

Brown, Charles R., C.-P. Yang, H. Mojtahedi, and G. S. Santo. 1995. Development of a RAPD-based map to study introgression of resistance to Colombia root-knot nematode. Am Potato J 72(10):615-616. (Abstract)

Carputo, D., T. Cardi, T. Chiari, G. Ferraiolo, and L. Frusciante. 1995. Tissue culture response in various wild and cultivated *Solanum* germplasm accessions for exploitation in potato breeding. Plant Cell Tissue Organ Cult 41(2):151-158.

Carputo, Domenico, Teodoro Cardi, Luigi Frusciante, and Stanley J. Peloquin. 1995. Male fertility and cytology of triploid hybrids between tetraploid *Solanum commersonii* (2n=4x=48, 2EBN) and Phureja-Tuberosum haploid hybrids (2n=2x=24, 2EBN). Euphytica 83:123-129.

Colon, L. T., R. C. Jansen, and D. J. Budding. 1995. Partial resistance to late blight (*Phytophthora infestand*) in hybrid progenies of four South American *Solanum* species crossed with diploid *S. tuberosum*. Theor Appl Genet 90(5):691-698.

Concibido, V. C., G. A. Secor, and S. H. Jansky. 1994. Evaluation of resistance to *Verticillium* wilt in diploid, wild potato interspecific hybrids. Euphytica 76:145-152.

Deahl, K. L., S. P. DeMuth, and D. A. Inglis. 1995. Occurrence of metalaxyl resistant isolates of *Phytophthora infestans* on hosts not treated with metalaxyl. Am Potato J 72(10):619. (Abstract)

DeJong, H., G. C. C. Tai, A. M. Murphy, T. R. Tarn, J. H. E. Thorpe, W. J. Arsenault, R. H. Bagnall, H. W. Platt, and D. A. Young. 1995. AC Novachip: A new potato cultivar with excellent chip quality after long storage and reconditioning. Am Potato J 72(7):417-425.

DeJong, H., T. R. Tarn, A. M. Murphy, G. C. C. Tai, R. H. Bagnall, W. J. Arsenault, J. H. E. Thorpe, H. W. Platt, D. A. Young, and H. T. Davies. 1995. AC Chaleur: A new early-maturing cultivar with excellent table quality. Am Potato J 72(7):393-399.

Demagante, A. L., P. M. Harris, and P. Vander Zaag. 1995. A promising method for screening drought tolerance in potato using apical cuttings. Am Potato J 72(10):577-588.

DiFonzo, C. D., D. W. Ragsdale, E. B. Radcliffe, and E. E. Banttari. 1994. Susceptibility to potato leafroll virus in potato: effects of cultivar, plant age at inoculation, and inoculation pressure on tuber infection. Pl Disease 78(12):1173-1177.

El-Leil, M. S., S. R Rivard, D. Morse, and M. Cappadocia. 1993. A polymorphic molecular marker cosegregates with the S-alleles in self-incompatible *Solanum chacoense* Bitt. Plant Cell Incompatibility Newsletter 25:26-30.

Flanders, K. L. and E. B. Radcliffe. 1992. Host plant resistance in *Solanum* germplasm. An appraisal of resistance to Colorado potato beetle, potato leafhopper, and potato flea beetle. St. Paul, USA; Univ. of Minn., Communication Resources, Distribution *Station Bulletin - Minnesota, Agricultural Experiment Station,* No. 599, 22 pp.

Flanders, Kathy L., Edward B. Radcliffe, and John G. Hawkes. 1995. Geographic distribution of insect resistance in potatoes. (Accepted for Euphytica.)

Freyre, R. and D. S. Douches. 1994. Development of a model for marker-assisted selection of specific gravity in diploid potato across environments. Crop Sci 34(5):1361-1368.

Freyre, R., S. Warnke, B. Sosinski, and D. S. Douches. 1994. Quantitative trait locus analysis of tuber dormancy in diploid potato (*Solanum* spp.). Theor Appl Genet 89(4):474-480.

Ganbalani, G. N. 1993. Resistance of two species of wild potatoes to the Colorado potato beetle, *Leptinotarsa decemlineata* (Say), (Cop, Chrysomelidae). Iranian J Ag Sci 24:83-89.

Goth, Robert W. and Kathleen G. Haynes. 1995. Field plot testing of potato germplasm for late blight resistance. Am Potato J 72(10):622. (Abstract)

Gurr, G. M. 1995. Effect of foliar pubescence on oviposition by *Phthorimaea operculella* Zeller (Lepidoptera: Gelechiidae). Pl Protection Qrtly 10(1):17-19.

Hanneman, R. E. Jr. 1995. Chipping from cold storage: Evaluation and incorporation of new sources of wild species germplasm of potato that chip directly from cold storage. Badger Common'Tater 47(11):42-47.

Hannapel, D. J. 1994. Gene expression during early tuber development. In: The molecular and cellular biology of the potato (W. R. Belknap, M. E. Vayda, and W. D. Park, Eds.). Wallingford, UK; CAB International Ed. 2, 161-174.

Hashemi, Seyed Badiozaman S-Z, A. S. Boe, R. H. Johansen, and H. Z. Cross. 1995. Genetic factors of tuberization in potatoes. Am Potato J 72(10):628. (Abstract)

Hawkes, J. G. 1994. Biodiversity and disease and pest resistance in wild and cultivated potatoes. A case study in genetic resource exploration and utilization. Collecta Clusiana. Ethnobotany and Ethnobiodiversity, Bio Tar Series No. 4, 54-67.

Hawkes, J. G. 1994. The historical and social role of the potato. In: EAPR 93 Actes. 12e Conference Triennale de l'Association Europeenne pour la Recherche sur la Pomme de Terre, Paris, France, 18-23 Juillet, 1993. Paris, France; INRA 75-84.

Haynes, K. G., D. R. Wilson, and M. S. Kang. 1995. Genotype x environment interactions for specific gravity in diploid potatoes. Crop Sci 35(4):977-981.

Helgeson, John P., R. Vaughan James, and Walter R. Stevenson. 1995. Late blight and early blight resistance from somatic hybrids between *Solanum bulbocastanum* and potato. Am Potato J 72(10):629. (Abstract)

Hosaka, K. 1995. Successive domestication and evolution of the Andean potatoes as revealed by chloroplast DNA restriction endonuclease analysis. Theor Appl Genet 90:356-363.

Hosaka, K., M. Mori, and K. Ogawa. 1994. Genetic relationships of Japanese potato cultivars assessed by RAPD analysis. Am Potato J 71(8):535-546.

Hutten, R. C. B., M. G. M. Schippers, J. G. T. Hermsen, and E. Jacobsen. 1995. Comparative performance of diploid and tetraploid progenies from 2x.2x crosses in potato. Euphytica 81(2):187-192.

Janssen, Geert J. W., Richard Janssen, and Coosje Hoogendoorn. 1995. Research on resistance to *Meloidogyne hapla* and *M. chitwoodi* in potato and wild *Solanum* ssp. Am Potato J 72(10):633. (Abstract)

Johnston, S. A. and R. E. Hanneman, Jr. 1995. The genetics of triploid formation and its relationship to endosperm balance number in potato. Genome 38(1):60-67.

Kang, S. G. and D. J. Hannapel. 1995. Nucleotide sequences of novel potato (*Solanum tuberosum* L.) MADS-box gene cDNAs and their expression in vegetative organs. Gene (in press).

Katsiotis, A., R. E. Hanneman, Jr., and R. A Forsberg. 1995. Endosperm Balance Number and the polar-nuclei activation hypotheses for endosperm development in interspecific crosses of *Solanaceae* and *Gramineae*, respectively. Theor Appl Genet 91:848-855.

Kriel, C. J., S. H. Jansky, N. C. Gudmestad, and D. H. Ronis. 1995. Immunity to *Clavibacter michiganensis* subsp. *sepedonicus*: screening of exotic *Solanum* species. Euphytica 82(2):125-132.

Kriel, C. J., S. H. Jansky, N. C. Gudmestad, and D. H. Ronis. 1995. Immunity to *Clavibacter michiganensis* subsp. *sepedonicus*: inheritance of immunity in *Solanum acaule*. Euphytica 82(2):133-139.

Lapitan, Nora L., Kristin Pedas, and Carol A. Ishimaru. 1995. Molecular genetics of immunity to bacterial ring rot in *Solanum acaule*. Am Potato J 72(10):636. (Abstract)

Liu, D., K. G. Raghothama, P. M. Hasegawa, and R. A. Bressan. Osmotin overexpression in potato delays development of disease symptoms. Proceedings of the National Academy of Sciences of the USA 91(5):1888-1892.

Liu, T.-H. A., L. C. Stephens, and D. J. Hannapel. 1995. Transformation of *Solanum brevidens* using *Agrobacterium tumefaciens*. Pl Cell Rpts (in press).

Longtine, Craig A., Edward B. Radcliffe, Florian I. Lauer, and David W. Ragsdale. 1995. Breeding potato with resistance. Valley Potato Grower 61(110):8-10.

Lopez Rodriguez, M., J. Castellanos Sahagun, and F. X. Flores Gutierrez. 1994. Evaluation of the parental value of potato clones for late blight resistance. Revista Fitotecnia Mexicana 17(1):76-85.

Lynch, D. R., L. M. Kawchuk, C. A. Schaupmeyer, J. Holley, D. Waterer, B. L. Rex, M. K. Pritchard, and J. Panford. 1995. Amisk: A clonal variant of Ranger Russet. Am Potato J 72(3):185-189.

Masuelli, R. W., E. Y. Tanimoto, c. r. Brown, and L. Comai. 1995. Irregular meiosis in a somatic hybrid between *S. bulbocastanum* and *S. tuberosum* detected by species-specific PCR markers and cytological analysis. Theor Appl Genet 91(3):401-408.

McGrath, J. M., S. M. Wielgus, T. F. Uchytil, H. Kim-Lee, G. T. Haberlach, C. E. Williams, and J. P. Helgeson. 1994. Recombination of *Solanum brevidens* chromosomes in the second backcross generation from a somatic hybrid with *S. tuberosum*. Theor Appl Genet 88(8):917-924.

McGrath, J. Mitchell, Susan M. Wielgus, Geraldine T. Haberlach, and John P. Helgeson. 1995. RFLP and RAPD analyses of *Solanum bulbocastanum* DNA in progeny of a somatic hybrid with potato. Am Potato J 72(10):640. (Abstract)

Miller, C. and D. Smallwood. 1995. West Texas Vegetable Breeding Newsletter, 1994, Potatoes. Tex. Agr. Exp. Sta., College Station and Lubbock, 100 p.

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7. APPROVED

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J. J. Pavek, Chairman, Technical Committee Date

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R. L. Lower, Chairman, Administrative Advisors Date