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ANNUAL REPORT OF COOPERATIVE REGIONAL PROJECTS

Supported by Allotments of the Regional Research Fund,
Hatch Act, as Amended August 11, 1955
January 1 to December 31, 1994

1. **PROJECT: Regional Research Project S-009**

Plant Genetic Resources Conservation and Utilization

2. **COOPERATING AGENCIES AND PRINCIPAL INVESTIGATORS:**

State Agricultural Experiment Station Representatives

AL	J. A. Mosjidis*	NC	W. T. Fike*
AR	T. E. Morelock*	OK	J. Kirby*
FL	G. M. Prine*	PR	R. V. Colon*
GA	W. D. Branch*	SC	B. B. Rhodes*
HA	P. J. Ito*	TN	D. L. Coffey* (Chairman)
KY	N. Taylor*	TX	F. Hons*
LA	D. LaBonte*	VA	R. E. Veilleux*
MS	C. E. Watson*		

Administrative Advisor G. F. Arkin

U.S. Department of Agriculture

Co-Administrative Advisor, ARS	M. E. Carter
Natl. Genetic Res. Program, ARS	H. L. Shands
Natl. Germplasm Resources Lab, ARS	A. K. Stoner*
National Seed Storage Lab, ARS	S. A. Eberhart
NCGR-Subtrop. Hort. Res. Stn., ARS	R. J. Schnell
NCGR-Tropical Fruit, ARS	F. T. Zee
Tropical Agri. Res. Stn., ARS	F. Vazquez
Northern Reg. Res. Center, ARS	R. Kleiman
Cooperative State Res. Serv., Rep.	D. A. Sleper
Soil Conservation Service	H. W. Everett*

Plant Genetic Resources Conservation Unit,
Cooperative ARS and SAES

Regional Coordinator	S. Kresovich
Research Plant Pathologist	A. G. Gillaspie
Research Horticulturist	R. L. Jarret
Curator, Agronomist	G. R. Lovell
Curator, Agronomist	R. N. Pittman
Curator, Agronomist	J. B. Morris

* Indicates voting member of the Technical Committee

3. PROGRESS OF WORK AND PRINCIPAL FINDINGS:

Genetic resources representing over 4,000 new accessions were received, increasing the Unit holdings to in excess of 80,000. The majority of the new material is sorghum and cowpea. Over 2,500 seed regenerations were accomplished across the various sites of, or cooperating with, the regional repository. In response to more than 700 requests, approximately 33,000 distributions were made (approximately 90% were supplied to domestic users). In complement, an enhanced effort on database development of the Germplasm Resources Information Network (GRIN) occurred in 1994. More detail can be obtained directly from the curators and/or database manager.

In collaboration with recognized crop experts, evaluation studies were conducted on: (1) morphological and agronomic/horticultural traits in pan-tropic forage legumes, watermelon, sorghum, peanut, and pepper; (2) nematode resistance in sweet potato; (3) tomato spotted wilt and other viruses in peanut and cowpea, and (4) watermelon mosaic virus in watermelon. Associated studies in molecular characterization were conducted by curators in sweet potato, seashore paspalum, and annual clovers.

Several unidentified viruses have been detected in the 1994 legume regeneration plots and work continues with host range, serology, electron microscopy, and electrophoretic techniques to identify these isolates. Once pathogens are characterized, efforts to sanitize collections is undertaken.

Efforts are underway to apply simple sequence repeat (SSR) DNA analysis to establish genetic identity, relatedness, and structure of accessions held in *ex situ* plant genetic resources repositories in the U.S. Size-fractionated genomic libraries have been constructed for various agronomic and horticultural crop species including sorghum, peanut, seashore paspalum, watermelon, sweet potato, pepper, canola, and apple. From 15,000-200,000 clones from each species have been screened for the presence of selected di-, tri-, and tetranucleotide repeat sequences. Following automated sequencing of selected clones, locus-specific primer pairs have been designed and tested for amplification of genetically defined polymorphisms. We have summarized results on loci abundance, characteristics, and informativeness. At present, over 100 primer pairs are available for use in the crops noted previously. Based on our experiences to date, we have revised techniques to improve efficiency, simplify protocols, increase the level of automation, and decrease the unit cost of each assay. Plans to employ automated fluorescence-based DNA

fragment analysis also are being implemented. This effort genetic analysis is conducted in collaboration with Pioneer Hi-Bred International, Linkage Genetics, Applied Biosystems, and Sequana Therapeutics.

4. USEFULNESS OF FINDINGS:

Results obtained via collaborative efforts among scientists at the regional repository, federal laboratories, state agricultural experiment stations, and industry are mutually beneficial as sources of information and products for all. Through the efforts at the repository, broad genetic representation of crop plants and their weedy/wild relatives is maintained for ready access. Cooperators identifying desirable traits among accessions aid in crop improvement efforts to produce a higher quality product more efficiently and in an environmentally safe manner. Information gained from cropping system studies of potential new crops may lead to greater diversification of agriculture in the southeastern United States

5. WORK PLANNED FOR NEXT YEAR:

Operation priorities for 1995 include significantly expanded seed regeneration activities, particularly for peanut, forage grasses, and vegetables. Database activities also will be increased to support regeneration needs. In complement, genetics and plant pathology efforts will be directed to support curatorial functions.

A continued effort to improve Unit infrastructure also is planned. It is expected that the local area network and the -20C seed storage facility will be completed and operational in 1995.

6. PUBLICATIONS ISSUED OR MANUSCRIPTS APPROVED DURING THE YEAR:

A list of approved manuscripts, theses, and miscellaneous reports addressing plant genetic resources conservation and utilization in the southeastern U.S. is attached as Appendix I.

7. APPROVED:

David L. Coffey
Chair, Technical Committee

2/27/95
Date

Administrative Adviser

3/6/95
Date

Publications Related to Evaluation and Use of Plant Germplasm in the S-9 Region, 1994

ALABAMA

Qiu, J., J.A. Mosjidis, and J.C. Williams. 1994. Seedling growth as affected by cotyledonary reserves in common vetch. Agronomy Journal 86:251-255.

Mosjidis, J.A., R. Rodriquez-Kabana, C.F. Weaver, and P.S. King. 1994. Reaction of nine Vicia species to Meloidogyne arenaria race 2 and Heterodera glycines race 4. Nematropica 24:1-5.

Mosjidis, J.A. and X. Zhang. 1993. Breeding system of several Vicia spp. Proceedings of the XVII International Grassland Congress Vol. I:200-201. Palmerston North, New Zealand and Queensland, Australia, February 8-21, 1993.

Qui, J. and J.A. Mosjidis. 1993. Screening Lespedeza cuneata accessions for hypocotyl elongation. Proceedings of the XVII International Grassland Congress Vol I:406-407. Palmerston North, New Zealand and Queensland, Australia, February 8-21, 1993.

Mosjidis, J.A., Rodrigo Rodriguez-Kabana, C.F. Weaver, and P.S. King. 1994. Reaction of nine Vicia species to Meloidogyne arenaria race 2 and Heterodera glycines race 4. p. 70. In: Narasimhalu P. (ed.) Proceedings of the Thirteenth Trifolium Conference, June 22-24, 1994, Charlottetown, Prince Edward Island, Canada.

Zhang, Xiufu. 1994. Reproductive biology of several Vicia spp. Ph. D. Dissertation, Auburn University, Auburn, Alabama.

Mosjidis, J.A., C.M. Owsley, M.S. Kirkland, D.M. Ball, and K.M. Rogers. 1994. AU GroundCover: A new commercial caley pea cultivar for southeastern producers. Auburn Univ. Agr. Expt. Stn. Highlights of Agric. Res. 41 (3):16.

Mosjidis, J.A., C.M. Owsley, M.S. Kirkland, D.M. Ball, and K.M. Rogers. 1994. AU EarlyCover: A full benefit cover crop. Auburn Univ. Agr. Expt. Stn. Highlights of Agric. Res. 41 (4):20-21.

Kalburtji, K. and J.A. Mosjidis. 1994. Decomposition of sericea lespedeza residues. Agronomy Abstracts. p. 152.

Qiu, J. and J.A. Mosjidis. 1994. Variability for seedling vigor of Lespedeza cuneata germplasm. Agronomy Abstracts. p. 222.

Xie, C. and J.A. Mosjidis. 1994. Phenotypic variances and statistical prediction intervals for the evaluation of variety tests. Agronomy Abstracts. p. 104-105.

Mosjidis, J. A. 1994. Interactions of the lespedezas with grasses. Agronomy Abstracts. p. 219.

ARKANSAS

Wasilwa, L.A., J.C. Correll, and T.E. Morelock. 1994. Screening watermelon for resistance to three races of Colletotrichum orbiculare. Phytopathology 84:1092. (Abs.)

FLORIDA

Prine, G.M., and T.V. Cunilio. 1994. Leucaena as a short rotation wood energy crop for Florida. Florida Scientist 57(1):1.

French, E.C., K.R. Woodard, D.A. Graetz, G.M. Prine, and H.H. Vanhorn. 1994. Utilization of dairy manure effluent for production of corn, small grain and forage over rhizoma peanut based system. Florida Scientist 57(1):1.

Prine, G.M. and E.C. French. 1993. Development of rhizoma peanut for forage in lower South USA. Proc. XVIII Int. Grassland Cong., Vol. 3, p. 2133-2134.

Stricker, J.A., G.M. Prine, K.R. Woodard, and D.B. Shibles. 1993. Biomass yield of tallgrass energy crops on phosphatic clay in Central Florida. Proc. Soil Crop Sci. Soc. Fla. 52:4-6.

French, E.C., G.M. Prine, W.R. Oeumpaugh, and R.W. Rice. 1994. Regional experience with forage Arachis in the United States. In: Biology and Agronomy of Forage Arachis. P.C. Kerridge and Bill Hardy (Eds.) Centro Internacional de Agricultura Tropical. Cali, Columbia, Publication 240. p. 169-186.

Gardner, C.S., G.M. Prine, R.D. Barnett, and E.C. French. 1994. Production and management of small grains on phosphatic clay in Central Florida. Univ. of FL., IFAS Publication SS-MLR-8. 7 pp.

Prine, G.M. 1994. Leucaena and tall grasses as energy crops in humid lower South, USA. Agronomy Abst. 1994 Annual meeting ASA, CSSA and SSSA at Seattle, WA, Nov. 13-18, 1994.

Prine, G.M., K.R. Woodard and T.V. Cunilio. 1994. Leucaena and tall grasses as energy crops in humid lower South. Proceeding 6th National Bioenergy Conference at Reno/Sparks, Nevada. Vol II:681-688.

Prine, G.M., K.R. Woodard,and T.V. Cunilio. 1994. Leucaena short rotation woody crop for lower South USA. Handout with poster at Short Rotation Intensive Cultures Forestry Conference, Mobile, AL, March 1-3. 2 pp.

Prine, G.M. and E.C. French (Editors). 1994. Perennial peanut newsletter Vol. 11: No. 1. 8 p.

Williams, M.J. 1994. Reproductive resource allocation in rhizoma perennial peanut. Crop Sci. 34:477-482.

Williams, M.J., C.G. Chambliss, and J.B. Brolmann. 1993. Phenological development of line 8400 stylo and alyceclover . . . Florida. pp. 2128-2129. Proc. XVII Inter. Grassl. Cong., Rockhampton, Queenland, Australia. 2303 pp.

Williams, M.J. 1994. Environmental influences on the competitive ability of rhizoma peanut and bahiagrass. pp. 177-181. Proc. American Forage Grassl. Conf. Lancaster, PA. American Forage Grassl. Council, Georgetown, TX.

Brolmann, J.B., C.G. Chambliss, M.J. Williams, and S.L. Sumner. 1993. Savanna Stylo - A new forage legume for south Florida. pp. 13-18. Proc. Intl. Conf. Livest. Tropics, Univ. of Florida, Gainesville, 148 pp.

GEORGIA

No publications.

HAWAII

No publications.

KENTUCKY

Taylor, N.L. and P.L. Cornelius. 1994. Influence of recurrent selection for flowering on flowering and yields in kura clover. Euphytica 72:9-14.

Taylor, N.L., J.M. Gillett, J.J.N. Campbell, and S. Berger. 1994. Crossing and morphological relationships among native clovers of eastern North America. Crop Sci. 34:1097-1100.

Giri, N., S. Saran, and N.L. Taylor. 1994. Karyotypic studies in some species of Trifolium. J. Cytol. Genet. 29:35-39.

LOUISIANA

Rolston, L.H., D.R. LaBonte, W.A. Mulkey, C.A. Clark, J.M. Cannon, and P.W. Wilson. 1994. L 86-33 sweetpotato germplasm. HortScience 29:712.

MISSISSIPPI

Hartwig, E.E. 1994. Registration of near-isogenic soybean germplasm lines D68-0099 and D68-0102, differing in ability to form nodules. Crop Sci. 34:822.

Hartwig, E.E., M.M. Kenty, and L.L. Lambert. 1994. Registration of soybean germplasm line D86-3429, resistant to root knot nematodes and foliar feeding insects. Crop Sci. 34:1135.

Hartwig, E.E., T.C. Kilen, and L.D. Young. 1994. Registration of 'Lyon' soybean. Crop Sci. 34:1412.

Kilen, T.C., and L. Lambert. 1994. Registration of D89-9121 soybean germplasm line resistant to foliar feeding insects, Phytopthora rot, and stem canker. Crop Sci. 34:1427.

Kilen, T.C., and L.D. Young. 1994. Registration of D92-6487 soybean germplasm line resistant to Phytopthora rot and soybean cyst nematode races 3 and 14. Crop. Sci. 34:821.

M'Ragwa, L.R.F., and C.E. Watson, Jr. 1994. Registration of 'KAT/FM-1' finger millet. Crop Sci. 34:1690-1691.

M'Ragwa, L.R.F., and C.E. Watson, Jr. 1994. Registration of 'KAT/PRO-1' proso millet. Crop Sc. 34:1689-1690.

M'Ragwa, L.R.F., and C.E. Watson, Jr. 1994. Registration of 'KAT/PM-1' pearl millet. Crop Sci. 34:1690.

M'Ragwa, L.R.F., C.E. Watson, Jr., and L.M. Gourley. 1994. Effects of selection for seedling root length and coleoptile length on yield components in pearl millet. American Society of Agronomy Meeting, Seattle, WA. 13-18 Nov. 1994. Agron. Abstr. p. 112.

McCarty, J.C., Jr., B. Tang, and J.N. Jenkins. 1994. Genetic diversity of primitive cotton germplasm access
ions. p. 107. In: D.J. Herber and D.A. Richter (ed.), Proc. Beltwide Cotton Conf., San Diego, CA. 5-8 Jan. 1994. National Cotton Council, Memphis, TN.

Pederson, G.A. 1994. Registration of MSSI short-internode white clover germplasm. Crop Sci. 34:545.

Philley, H.W. 1994. Inheritance of cold tolerance in St. Augustinegrass. M.S. Thesis, Mississippi State University. 62.

Philley, H.W., C.E. Watson, Jr., J.V. Krans, and J.M. Goatley, Jr. 1994. Inheritance of cold tolerance in St. Augustinegrass. American Society of Agronomy Annual Meeting. Seattle, WA. 13-18 Nov. 1994. Agron. Abstr. p. 188.

Shappley, Z.W., J.N. Jenkins, C.E. Watson, and A.L. Kahler. 1994. RFLP analysis of two F2 populations. p. 702. In D.J. Herber and D.A. Richter (ed.), Proc. Beltwide Cotton Conf., San Diego CA. 5-8 Jan. 1994. National Cotton Council, Memphis, TN.

Tang, B., J.N. Jenkins, C.E. Waton, J.C. McCarty, and R.G. Creech. 1994. Evaluation of heritability and genetic correlation in F2 hybrids of cotton. American Society of Agronomy Annual Meeting. Seattle, WA. 13-18 Nov. 1994. Agron. Abstr. p. 106.

NORTH CAROLINA

No publications.

OKLAHOMA

No publications.

PUERTO RICO

Brunner, B.R. 1994. Promising papaya varieties for the Caribbean. In Proceedings of the 30th Annual Meeting Caribbean Food Crop. Soc. St. Thomas USVI, July 31 to Aug. 5, 1994. (In press)

Brunner, B.R. 1994. Nuevas variedades de papaya para Puerto Rico. In Proceedings of Foro del cultivo, produccion y manejo de papaya. Agricultural Experiment Station, University of Puerto Rico. Aguadilla, P.R. May 20, 1994. (In press)

Colberg-Rivera, O. and G. Ruiz-Sifre. 1994. Seis cultivares de pepinillo (Cucumis sativus) en la costa sur de Puerto Rico. (Res. note) J. Agric. Univ. P.R. 78:71-72.

Gonzalez, A. and I.B. de Caloni. 1994. Evaluacion sensorial de los cultivos de name 'Binugas' y 'Gunung' cosechados a distintos meses de la siembra. (Res. note) J. Agric. Univ. P.R. 78: (In press)

Velez-Colon, R. 1994. Variation in fruit characteristics among guava (Psidium guajava) genotypes. In Proceedings of the 30th Annual Meeting Caribbean Food Crop Soc. St. Thomas USVI, July 31 to Aug. 5, 1994. (In press)

SOUTH CAROLINA

No publications.

TENNESSEE

No publications.

TEXAS

Bhangoo, M.S., C.G. Cook, and K. Sakouri. 1994. Effect of soil salinity on kenaf production in the San Joaquin Valley, California. California Agric. Tech. Institute Res. Bull. Pub. No. 940102. 6 pp.

Bhangoo, M.S., C.G. Cook, T.A. Jacobson, and A. Gaberhiwet. 1994. Performance of kenaf varieties in the San Joaquin Valley, California. California Agric. Tech. Institute Res. Bull. Pub. No. 940802. 4 pp.

Cook, C.G. and B.A. Mullin. 1994. Growth response of kenaf to the root-knot nematode/soil-borne fungi complex. Crop Science. 34:1455-1457.

Cook, C.G. and J.R. Smart. 1994. Seed quality evaluation of eight kenaf cultivators. Industrial Crops and Products 3:213-216.

Ervin, R.T., T.M. Khalema, G.C. Peterson, and G.L. Teetes. 1994. Sorghum midge (Diptera: Cecidomyiidae): Cost analysis of developing a midge resistant sorghum hybrid. J. Econ. Entomol. (In press)

Hallmark, W.B., L.P. Brown, H.P. Viator, R.J. Habetz, W.D. Caldwell, and C.G. Cook. 1994. Kenaf: A new crop for Louisiana. Louisiana Agriculture 37:28-31.

Krapovickas, A., W.C. Gregory, J.F.M. Valls, and C.E. Simpson. 1994. 26. Arachis giacomettii Krapov., W.C. Gregory, Valls & C.E. Simpson. Nov. sp. pp. 71-72. (Description of new species). IN: Taxonomia del genero Arachis (Leguminosae). Krapovickas, A. and Gregory, W.C. Bonplandia 8:1-186. Corrientes, Argentina.

Krapovickas, A., W.C. Gregory, and C.E. Simpson. 1994. 35. Arachis chiquitana Krapov., W.C. Gregory, and C.E. Simpson. Nov. Sp. pp. 89-90. (Description of new species). IN: Taxonomia del genero Arachis (Leguminosae). Krapovickas, A. and Gregory, W.C. Bonplandia 8:1-186. Corrientes, Argentina.

Krapovickas, A., W.C. Gregory, and C.E. Simpson. 1994. 36. Arachis matiensis Krapov., W.C. Gregory, and C.E. Simpson. Nov sp.pp. 90-91. (Description of new species.). IN: Taxonomia del genero Arachis (Leguminosae). Krapovickas, A. and Gregory, W.C. Bonplandia 8:1-186. Corrientes, Argentina.

Krapovickas, A., W.C. Gregory, and C.E. Simpson. 1994. 44. Arachis cruziana Krapov., W.C. Gregory, and C.E. Simpson. Nov. Sp. p. 111. (Description of new species). IN:

Taxonomia del genero Arachis (Leguminosae). Krapovickas, A. and Gregory, W.C. Bonplandia 8:1-186. Corrientes, Argentina.

Krapovickas, A., W.C. Gregory, and C.E. Simpson. 1994. 46. Arachis magna Krapov., W.C. Gregory, and C.E. Simpson. Nov. Sp. pp. 113-114. (Description of new species). IN: Taxonomia del genero Arachis (Leguminosae). Krapovickas, A. and Gregory, W.C. Bonplandia 8:1-186. Corrientes, Argentina.

Krapovickas, A., W.C. Gregory, and C.E. Simpson. 1994. 56. Arachis benensis Krapov., W.C. Gregory, and C.E. Simpson. Nov sp.pp. 128-130. (Description of new species.). IN: Taxonomia del genero Arachis (Leguminosae). Krapovickas, A. and Gregory, W.C. Bonplandia 8:1-186. Corrientes, Argentina.

Krapovickas, A., W.C. Gregory, and C.E. Simpson. 1994. 59. Arachis Herzogii Krapov., W.C. Gregory, and C.E. Simpson. Nov. Sp. p. 131-132. (Description of new species). IN: Taxonomia del genero Arachis (Leguminosae). Krapovickas, A. and Gregory, W.C. Bonplandia 8:1-186. Corrientes, Argentina.

Krapovickas, A., W.C. Gregory, and C.E. Simpson. 1994. 66. Arachis Kempff-Mercadoi Krapov., W.C. Gregory, and C.E. Simpson. Nov. Sp. p. 140-142. (Description of new species). IN: Taxonomia del genero Arachis (Leguminosae). Krapovickas, A. and Gregory, W.C. Bonplandia 8:1-186. Corrientes, Argentina.

Nelson, L.R., C.G. Cook, S. Ward, and J. Crowder. 1994. Kenaf yield evaluation at Overton. Texas Agric. Exp. Stn. Res. Center. Tech. Rept. 94-1:145-146.

Nunes, E., G.R. Smith, I.J. Pemberton, and C. Gilbert. 1994. Evaluation of rose clover germplasm for flowering date. Texas Agric. Exp. Stn. Res. Center Tech. 94-1:87-88.

Nunes, E., G.R. Smith, I.J. Pemberton, and C. Gilbert. 1994. Evaluation of rose clover germplasm for cold tolerance. Texas Agric. Exp. Stn. Res. Center Tech. 94-1:89-90.

Ocumpaugh, W.R. 1994. Iron-deficiency chlorosis diversity in the US rose clover collection. p. 219. In Agronomy Abstracts. American Society of Agronomy, Madison, WI.

Ocumpaugh, W.R. and G.R. Smith. 1994. Iron deficiency chlorosis variation in the Bulgarian rose clover collection. In: Proc. 13th Trifolium Conference. Charlottetown, P.E.I. Canada. June 22-24, 1994. p. 76. (In press)

Peterson, G.C., G.L. Teetes, R.M. Anderson, and B.B. Pendleton. 1994. Yield and selected traits of sorghum midge-resistant sorghum hybrids. Ann. Plant Res. Insects Newsl. 20:30-31.

Peterson, G.C. G.L. Teetes, and B.B. Pendleton. 1995. Resistance of sorghum to sorghum midge in the United States. Int. Sorghum and Millets Nesl. 35-48-63.

Rahmes, J.N. and W.R. Ocumpaugh. 1994. Rate of establishment and spread of rhizoma peanuts in South Texas. 1994. Field Day and Centennial Celebration, Texas A&M Univ. Agric. Res. Stn. Beeville, Information Report 94-1. p. F5-F9.

Reed, R.L., M.A. Sanderson, M.A. Hussey, W.R. Ocumpaugh, J.C. Read, C.R. Tischler, and B.A. Young. 1994. Development of optimal establishment and cultural practices for switchgrass grown for biomass in Texas. Forage Research in Texas. 1993. PR-5090, p. 32-34.

Smith, G.R. 1994. Evaluation and improvement of kura clover. p. 215. Agronomy Abstracts. American Society of Agronomy, Madison, WI.

Teetes, G.L., R.M. Anderson, B.B. Pendleton, and G.C. Peterson. 1994. Field evaluation of sorghum midge-resistance sorghum hybrids, 1993. Arthropod Management Tests (In press)

Teetes, G.L., R.M. Anderson, and G.C. Peterson. 1994. Exploitation of sorghum nonpreference resistance to sorghum midge (Diptera:Cecidomyiidae) using mixed plantings of resistant and susceptible sorghum hybrids. J. Econ. Entomol. 87:826-831.

VIRGINIA

Hilu, K.W. 1994. Evidence from RAPD markers in the evolution of Echinochloa millets (Poaceae). Pl. Syst. Evol. 189:247-257.

Hilu, K.W. and H.T. Stalker. 1994. Evolution of peanut (Arachis hypogaea). Amer. J. Bot. Suppl. 81:80-81. (Abstr.)

M'Ribu, K. and K.W. Hilu. 1993. Detection of interspecific and intraspecific variation in Panicum millets through random amplified polymorphic DNA (RAPD). Theor. Appl. Genet. 88:412-416.

Mandelbau, E.I., W.E. Barbeau, and K.W. Hilu. 1994. Protein, calcium, and iron content of wild and cultivated species of Echinochloa millets. Plant Foods for Human Nutrition (In press).

Werth, C.R., K.W. Hilu, and C.A. Langner. 1994. Isozymes of Eleusine (Gramineae) and the origin of finger millet. Amer. J. Bot. 81:1186-1197.

PLANT GENETIC RESOURCES CONSERVATION

Silva Dias, J.C., A.A. Monteiro, and S. Kresovich. 1994. Genetic diversity and taxonomy of Portguese Tronchuda cabbages and Galega kale landraces using isozyme analysis. Euphytica 75:221-230.

Lamboy, W.F., J.R. McFerson, A.L. Westman, and S. Kresovich. 1994. Use of isozymes information in the management of the United States Brassica oleracea L. genetic resources collection. Gen. Res.and Crop. Domest. 41:99-108.

Kresovich, S., W.F. Lamboy, R. Li, J. Ren, A.K. Szewc-McFadden, and S.M. Bliek. 1994. Application of molecular methods and statistical analyses for discrimination of accessions and clones of vetiver grass. Crop. Sci. 34:805-809.

NATIONAL SEED STORAGE LABORATORY

Berjak, P., J.M. Farrant, N.W. Pammenter, C.W. Vertucci, and J. Wesley-Smith. 1993. Current understanding of desiccation-sensitive (recalcitrant) seeds: Development, states of water and responses to dehydration and freezing. Fourth International Workshop on Seeds, Angers, France. 705-714.

Berjak, P., C.W. Vertucci, and N.W. Pammenter. 1993. Effects of developmental status and dehydration rate on characteristics of water and disi
ccation-sensitivity in recalcitrant seeds of Camellia sinensis. Seed Sci. Res. 3:155-166.

Blackman, S.A. and A.C. Leopold. 1993. Chemical and physical factors in seed deterioration. Fourth International Workshop on Seeds, Angers, France, 731-737.

Blackman, S.A., R.L. Obendorf, and A.C. Leopold. 1993. The role of LEA proteins in desiccation tolerance in soybeans. Fourth International Workshop on Seeds, Angers, France. 121-126.

Connor, K.F. and L.E. Towill. 1993. Pollen-handling protocol and hydration/dehydration characteristics of pollen for application to long-term storage. Euphytica 68:77-84.

Crossa, J., C.M. Hernandez, P. Bretting, S.A. Eberhart, and S. Taba. 1993. Statistical genetic considerations for maintaining germplasm collections. Theor. Appl. Genet. 86:673-678.

Eberhart, S.A. 1993. Plant genetic resources. Proc. Workshop on Adaption of Plant to Soil Stresses. INTSORMIL Pub. No. 94-2 p. 51-61.

Eberhart, S.A. 1993. Concept of worldwide germplasm utilization. 18th Biennial Grain Sorghum Research and Utilization Conference. Lubbock, Texas, p. 12-16.

Howarth, M.S. and P.C. Stanwood. 1993. Measurement of seedling growth rate by machine vision. Trans. ASAE 36:959-963.

Howarth, M.S. and P.C. Stanwood. 1993. Tetrazolium staining viability seed test using color image processing. Trans. ASAE 36:1937-1940.

Pammenter, N.W., C.W. Vertucci, and P. Berjak. 1993. Responses to dehydration in relation to non-freezable water in desiccation-sensitive and -tolerant seeds. Proc. Fourth International Workshop on Seeds, Angers, France. 867-872.

Phillips, R.L. and S. Eberhart. 1993. Novel methodology in plant breeding -- discussion. p. 647. In Crop Science Society of America (ed.), International Crop Science I. Madison, WI.

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