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1. **Education**:

Degree	**University**	**Field**	**Year**
B.S.	University of California, Riverside	Plant Science	1970
M.S.	University of California, Riverside	Plant Science	1972
Ph.D.	University of California, Riverside	Botany	1976

2. **Positions**:

Assistant Professor, Horticulture Department, Purdue University	1977-1981
Associate Professor, Horticulture Department, Purdue University	1981-1985
Professor, Horticulture and Landscape Architecture Department, Purdue University	1985-2005
Bruno C. Moser Distinguished Professor, Horticulture and Landscape Architecture Department, Purdue University	2005-present

3. **Honors and Special Appointments:**
   - The National Canners Association Award (American Society for Horticultural Science) – 1974
   - Wilson J. Popenoe Award (American Society for Horticultural Science) – 1980
   - Alex Laurie Award (American Society for Horticultural Science) – 1983
   - Associate Editor for In Vitro Cellular and Developmental Biology, 1998-2002
   - ISI (Institute for Scientific Information) Highly Cited Researcher – Plant and Animal Science – 2001-present
   - Faculty of 1000 Biology - 2008
   - Editorial Board for Plant Cell, Tissue and Organ Culture**,** 2001-2002
   - Chair Salinity and Water Stress Gordon Conference, 2002
   - Monitoring Editor for Plant Physiology, 2004-2010
   - Handling Editor – Plant Journal – 2007-present
   - Editorial Board – Plant and Cell Physiology – 2009-present
   - AAAS Fellow – elected in Dec. 2010 by the AAAS Council (awarded Feb. 2011)

4. **Membership in Professional Societies:**
   - American Society of Plant Biologists
   - American Association for the Advancement of Science (AAAS)

5. Courses:

Year/Semester	Course Number and Title	Credit No.	No. of Students
1978/Winter	HORT 690/Plant Cell, Tissue Culture	4	12
1979/Winter	HORT 690/Plant Cell, Tissue Culture	4	8
1981/Winter	HORT 690/Plant Cell, Tissue Culture	4	17
1982/Winter	HORT 650/Plant Cell, Tissue Culture	1	24
1984/Winter	HORT 650/Plant Cell, Tissue Culture	1	13
1986/Winter	HORT 650/Plant Cell, Tissue Culture	1	15
1988/Winter	HORT 650G/Plant Cell, Tissue Culture	1	17
1990/Fall	HORT 650G/Plant Environ Stress Physiol	1(4-lectures)	10
1992/Fall	HORT 551/Plant Physiology	3(2 lectures)	10
1993/Fall	HORT 650G/Plant Cell, Tissue Culture	1	14
1993/Fall	HORT 551/Plant Physiology	3(2 lectures)	17
1994/Winter	HORT 590M/*In situ* hybridization	0.5	9
1994/Fall	HORT 590M/Immunocytochemistry	0.5	4
1995/Fall	BIOL 551/Ion homeostasis	3(2 lectures)	7
1995/Fall	HORT 590M/Immunocytochemistry	0.5	7
1997/Winter	HORT 590H/Plant Cell, Tissue Culture	1	16
1997/Fall	HORT 601/Planning & Presenting Research	1	7
1998/Winter	HORT 590H/Plant Cell, Tissue Culture	1	14
1998/Fall	HORT 601/Planning & Presenting Research	1	7
1999/Winter	HORT 515/Plant Cell, Tissue Culture	1	9
2000/Winter	HORT 515/Plant Cell, Tissue Culture	1	11
2000/Fall	HORT 601/Planning & Presenting Research	1	10
2001/Winter	HORT 515/Plant Cell, Tissue Culture	1	7
2002/Winter	HORT 515/Plant Cell, Tissue Culture	1	9
2002/Fall	HORT 301/Plant Physiology	3(co-instructor)	60
2004/Winter	HORT 515/Plant Cell, Tissue Culture	1	10
2005/Winter	HORT 515/Plant Cell, Tissue Culture	1	7
2006/Winter	HORT 515/Plant Cell, Tissue Culture	1	2
2007/Fall	HORT 301/Plant Physiology	4	56
2008/Fall	HORT 301/Plant Physiology	4	45
2009/Fall	HORT 301/Plant Physiology	4	40
2010/Fall	HORT 301/Plant Physiology	4	42

6. Publications:

ISI Web of Science Citation report:

Times Cited – 10,015, Average Citations/paper – 36.68, h-index – 58

A. Refereed Papers

207. Yoo CY, Finkler A, Weng H, Reddy ASN, Poovaiah BW, Fromm H, Mickelbart MV, Hasegawa PM (2012) Ca^{2+}/calmoduling allosterically inhibits GTL1 transcriptional repressor activity. Science (In submission)
206. Yoo CY, Wang S, Hasegawa PM, Mickelbart MV (2012) Environmental control of adaptation and acclimation to regulate stomatal density and plant water use. Trends Plant Sci. (In submission)
205. Hasegawa PM (2012) Sodium (Na^{+}) homeostasis and salt tolerance in plants. Environ. Exp. Bot. (In press)

204. Yoo CY, Weng S, Hasegawa PM, Mickelbart MV (2012) Efficient plant water use through stomatal development regulation. Trends Plant Sci. (In preparation)

203. Ling Y, Zhang C, Chen T, Hao H, Liu P, Bressan RA, Hasegawa PM, Jin JB, Lin J (2012) Mutation in SUMO E3 ligase, SIZ1, Disrupts the Mature Female Gametophyte in *Arabidopsis*. PLoS ONE 7(1): e29470. doi:10.1371/journal.pone.0029470

202. Weng H, Yoo CY, Gosney MJ, Hasegawa PM, Mickelbart MV (2012) Poplar GTL1 is a Ca^{2+}/calmodulin-binding transcription factor that functions in plant water use efficiency and drought tolerance. PLoS ONE 7:e32925

201. Miura K, Ohta M, Nakazawa M, Ono, M, Hasegawa PM (2011) ICE1 Ser403 is necessary for protein stabilization and regulation of cold signaling and tolerance. Plant J 67:269-279

200. Miura K, Lee J, Gong Q, Ma S, Jin JB, Yoo CY, Miura T, Sato A, Bohnert HJ, Hasegawa PM (2011) SIZ1 regulation of phosphate starvation-induced root architecture remodeling involves the control of Auxin accumulation. Plant Physiol 155:1000-1012

199. Yoo CY, Hasegawa PM, Mickelbart MV (2011) Regulation of stomatal density by GTL1 transcription factor for improving water use efficiency. Plant Signal Behav 6:1069-1071

198. Yoo CY, Pence HE, Jin JB, Miura K, Gosney M, Hasegawa PM, Mickelbart MV (2010) The *Arabidopsis* GTL1 transcription factor regulates water use efficiency and drought tolerance by modulating via *trans*repression of *SDD1*. Plant Cell 22:4128-4141

197. Miura K, Hasegawa PM (2010) Sumoylation and other ubiquitin-like post-translational modifications in plants. Trends Cell Biol 20:223-232

196. Miura K, Lee J, Miura T, Hasegawa PM (2010) SIZ1 controls cell growth and plant development in Arabidopsis through salicylic acid. Plant Cell Physiol 51:103-113

195. Leidi EO, Barragán V, Rubio L, El-Hamdaoui A, Ruiz MT, Cubero B, Fernández JA, Bressan RA, Hasegawa PM, Quintero FJ, Pardo JM (2010) The AtNHX1 exchanger mediates potassium compartmentation in vacuoles of transgenic tomato. Plant J 61:495-506

194. Miura K, Lee, J, Jin JB, Yoo CY, Miura T, Hasegawa PM (2009) Sumoylation of ABI5 by the *Arabidopsis* SUMO E3 ligase SIZ1 negatively regulates abscisic acid signaling. Proc Natl Acad Sci 106:5418-5423

193. Cubero B, Nakagawa Y, Jiang XY, Miura KJ, Li F, Raghothama KG, Bressan RA, Hasegawa PM, Pardo JM (2009) The phosphate transporter PHT4;6 is a determinant of salt tolerance that is localized to the Golgi apparatus of Arabidopsis. Mol Plant 2:535-552

192. Hernandez A, Jiang XY, Cubero B, Nieto PM, Bressan RA, Hasegawa PM, Pardo JM (2009) Mutants of the *Arabidopsis thaliana* Cation/H^+ antiporter AtNHX1 conferring increased salt tolerance in yeast: The endosome/prervacuolar compartment is a target for salt toxicity. J Biol Chem 284:14276-14285

191. Yoo CY, Pence HE, Hasegawa PM, Mickelbart MV (2009) Regulation of transpiration to improve crop water use. Crit Rev Plant Sciences 28:410-431

190. Miura K, Hasegawa PM (2009) Sumoylation and abscisic acid signaling. Plant Signal Behav 4:1176-1178

189. Jin JB, Jin YH, Lee Y, Miura K, Yoo CY, Kim W-Y, Van Oosten M, Hyun Y, Somers DE, Lee I, Yun D-J, Bressan RA, Hasegawa PM (2008) The SUMO E3 ligase, *AtSIZ1*, regulates flowering by controlling a salicylic acid-mediated floral promotion pathway and through affects on *FLC* chromatin structure. Plant J 53:530-540

188. Chung J-S, Zhu J-K, Bressan RA, Hasegawa PM, Shi H (2008) Reactive oxygen species mediate Na^+-induced *SOS1* mRNA stability in Arabidopsis. Plant J 53:554-565

187. Zhu J, Jeong J, ZhuY, Sokolchik I, Miyazaki S, Zhu J-K, Hasegawa PM, Bohnert HJ, Shi H, Yun D-J, Bressan RA (2008) Involvement of *Arabidopsis* HOS15 in histone deacetylation and cold tolerance. Proc Natl Acad Sci USA. 105:4945-4950

186. Miura K, Hasegawa PM (2008) Regulation of cold signaling by sumoylation of ICE1. Plant Signaling & Behavior 3:52-53

185. Jin JB, Hasegawa PM (2008) Flowering time regulation by the SUMO E3 ligase SIZ1. Plant Signaling & Behavior 3:891-892

184. Miura K, Jin JB, Lee J, Yoo CY, Stirm V, Miura T, Bressan RA, Yun D-J, Hasegawa PM (2007) SIZ1-Mediated Sumoylation of ICE1 Controls CBF3/DREB1A expression and freezing tolerance in Arabidopsis. Plant Cell 19:1403-1414

183. Zhu J, Koo YD, Zhu J-K, Jenney, Jr. FE, Adams MWW, Zhu Y, Yun D-J, Hasegawa PM, Bressan RA (2007) An enhancer mutant of the *Arabidopsis salt overly sensitive 3* mediates both ion homeostasis and the oxidative stress response. Mol Cell Biol 27:5214-5224

182. Sridhar VV, Kapoor A, Zhang K, Zhu J, Zhao T, Hasegawa PM, Bressan RA, Zhu J-K (2007) Control of DNA methylation and heterochromatic silencing by histone H2B deubiquitination. Nature 447:735-738

181. Inan G, Goto F, Jin JB, Rosado A, Koiwa H, Shi H, Hasegawa PM, Bressan RA, Maggio A, Li X (2007) Isolation and characterization of shs1, a sugar-hypersensitive and ABA-insensitive mutant with multiple stress responses. Plant Mol Biol 65:295-309

180. Miura K, Jin JB, Hasegawa PM (2007) Sumoylation, a post-translational regulatory process in plants. Curr Opin Plant Biol 10:495-502

179. Shoji T, Suzuki K, Abe T, Kaneko Y, Shi HZ, Zhu JK, Rus A, Hasegawa PM, Hashimoto T (2006) Salt stress affects cortical microtubule organization and helical growth in Arabidopsis. Plant Cell Physiol 47:1158-1168

178. Maggio A, Zhu JK, Hasegawa PM, Bressan RA (2006) Osmogenetics: Aristotle to Arabidopsis. Plant Cell 18:1542-1557

177. Koiwa H, Bressan RA, Hasegawa PM (2006) Identification of plant stress-responsive determinants in Arabidopsis by large-scale forward genetic screens. J Exp Bot 57:1119-1128

176. Bang W, Kim S, Ueda A, Vikram M, Yun D, Bressan RA, Hasegawa PM, Bahk J, Koiwa H (2006). *Arabidopsis* carboxyl-terminal domain phosphatase-like isoforms share common catalytic and interaction domains but have distinct *in planta* functions. Plant Physiol 142:586-594

175. Yoo CY, Miura K, Jin JB, Lee J, Park HC, Salt DE, Yun D-J, Bressan RA, Hasegawa PM (2006) SIZ1 small ubiquitin-like modifier E3 ligase facilitates basal thermotolerance in Arabidopsis independent of salicylic acid. Plant Physiol 142:1548-1558

174. Lee J, Nam J, Park HC, Na G, Miura K, Jin JB, Yoo CY, Baek D, Kim DH, Jeong JC, Kim D, Lee SY, Salt DE, Mengiste T, Gong Q, Ma S, Bohnert HJ, Kwak S-S, Bressan RA, Hasegawa PM, Yun D-J (2006) Salicylic acid-mediated innate immunity in Arabidopsis is regulated by SIZ1 SUMO E3 ligase. Plant J 49:79-90

173. Rosado A, Schapire AL, Bressan RA, Harfouche AL, Hasegawa PM, Valpuesta V, Botella MA (2006) The *Arabidopsis* tetratricopeptide repeats containing protein TTL1 is required for osmotic stress responses and ABA sensitivity. Plant Physiol 142:1113-1126

172. Narasimhan ML, Coca MA, Jin J, Yamauchi T, Ito Y, Kadowaki T, Kim KK, Pardo JM, Damsz B, Hasegawa PM, Yun D-J, Bressan RA (2005) Osmotin is a homolog of mammalian adiponectin and controls apoptosis in yeast through a homolog of mammalian adiponectin receptor. Mol Cell 17:171-180

171. Miura K, Rus A, Sharkhuu A, Yokoi S, Karthikeyan AS, Raghothama KG, Baek D, Koo YD, Jin JB, Bressan RA, Yun D-J, Hasegawa PM (2005) The *Arabidopsis* SUMO E3 ligase SIZ1 controls phosphate deficiency responses. Proc Natl Acad Sci (USA) 102:7760-7765

170. Zhu J, Verslues PE, Zheng X, Lee B-h, Zhan X, Manabe Y, Sokolchik I, Zhu Y, Dong C-H, Zhu J-K, Hasegawa PM, Bressan RA (2005) *HOS10* encodes a novel R2R3-type MYB transcription factor essential for cold acclimation in plants. Proc Natl Acad Sci (USA) 102:9966-9971

169. Lalitha S, Shade RE, Murdock LL, Bressan RA, Hasegawa PM, and Nielsen SS (2005) Effectiveness of recombinant soybean cysteine proteinase inhibitors against selected crop pests. Comp Biochem Physiol Part C140:227-235

168. Lalitha S, Shade RE, Murdock LM, Hasegawa PM, Bressan RA, Nielsen SS (2005) Comparison of chemical characteristics of three soybean cysteine protinase inhibitors. J Agric Food Chem 53:1591-1597

167. Rus AM, Bressan RA, Hasegawa PM (2005) Unraveling salt tolerance in crops. Nature Genetics 37:1029-1030

166. Kapoor A, Agarwal M, Andreucci A, Zheng XW, Gong ZZ, Hasegawa PM (2005) Mutations in a conserved replication protein suppress transcriptional gene silencing in a DNA-methylation-independent manner in Arabidopsis. Current Biol 15:1912-1918

165. Salzman RA, Koiwa H, Ibeas JI, Pardo JM, Hasegawa PM, Bressan RA (2004) Inorganic cations mediate antimicrobial activity of PR5 proteins through cell surface glycans. Mol Plant Microbe Inter 17:770-788

164. Wang ZI, Li PH, Fredricksen M, Gong ZH, Kim CS, Zhang CQ, Bohnert HJ, Zhu JK, Bressan RA, Hasegawa PM, Zhao YX, Zhang H (2004) Expressed sequence tags from *Thellungiella halophila*, a new model to study plant salt-tolerance. Plant Science 166:609-616

163. Inan G, Zhang H, Li P, Wang Z, Cao Z, Zhang C, Quist TM, Goodwin SM, Zhu J, Shi H, Damsz B, Charbaji T, Gong Q, Ma S, Fredricksen M, Galbraith DW, Jenks MA, Rhodes D, Hasegawa PM, Bohnert HJ, Joly RJ, Bressan RA, Zhu J-K (2004) Salt Cress (*Thellungiella halophila*): A halophyte and cryophyte Arabidopsis relative model system (ARMS) and its applicability to molecular genetic analyses of growth and development of extremophiles. Plant Physiol 135:1718-1737

162. Rus A, Lee B-H, Muñoz-Mayor A, Sharkhuu A, Miura K, Zhu J-K, Bressan RA, Hasegawa PM (2004) AtHKT1 facilitates Na^+ homeostasis and controls K^+ nutrition *in planta.* Plant Physiol 136:2500-2511

161. Ruggiero B, Koiwa H, Manabe Y, Quist TM, Inan G, Saccardo F, Joly RJ, Hasegawa PM, Bressan RA, Maggio A (2004) Uncoupling the effects of ABA on plant growth and water relations: Analysis of *sto1/nced3*, an ABA-deficient but salt stress tolerant mutant in *Arabidopsis thaliana*. Plant Physiol 136:3134-3147

160. Zhu J, Shi H, Lee B-H, Damsz B, Cheneg S, Stirm V, Zhu J-K, Hasegawa PM, Bressan RA (2004) An *Arabidopsis* homeodomain transcription factor gene, *HOS9*, mediates cold tolerance through a CBF-independent pathway. Proc Natl Acad Sci (USA) 101:9873-9878

159. Koiwa H, Hausmann S, Bang WY, Ueda A, Kondo N, Hiraguri A, Fukuhara T, Bahk JD, Yun DJ, Bressan RA, Hasegawa PM, Shuman S (2004) *Arabidopsis* C-terminal domain phosphatase-like 1 and 2 are essential Ser-5-specific C-terminal domain phosphatases. Proc Natl Acad Sci (USA) 101:14539-14544

158. Amirhusin B, Shade RE, Koiwa H, Hasegawa PM, Bressan RA, Murdock LL, Zhu-Salzman K (2004) Soyacystatin N inhibits proteolysis of wheat alpha-amylase

inhibitor and potentiates toxicity against cowpea weevil. J Economic Entm 97:2095-2100

157. Min K, Ha SC, Hasegawa PM, Bressan RA, Yun DJ, Kim KK (2004) Crystal structure of osmotin, a plant antifungal protein. Proteins: Structure, Function & Genetics 54:170-173

156. Koiwa H, Li F, McCully MG, Mendoza I, Koizumi N, Manabe Y, Nakagawa Y, Zhu J, Rus A, Pardo JM, Bressan RA, Hasegawa PM (2003) The STT3a subunit isoform of the arabidopsis oligosaccharyltransferase controls adaptive responses to salt/osmotic stress. Plant Cell 15:2273-2284

155. Veronese P, Ruiz MT, Coca MA, Hernandez-Lopez A, Lee H, Ibeas JI, Damsz B, Pardo JM, Hasegawa PM, Bressan RA, Narasimhan ML (2003) In defense against pathogens. Both plant sentinels and foot soldiers need to know the enemy. Plant Physiol 131:1580-1590

154. Huh G-H, Damsz B, Matsumoto TK, Reddy MP, Rus AM, Ibeas JI, Narasimhan ML, Bressan RA, Hasegawa PM (2002) Salt causes ion disequilibrium-induced programmed cell death in yeast and plants. Plant J 29:649-659

153. Zhu-Salzman K, Hammen PK, Salzman RA, Koiwa H, Bressan RA, Murdock LL, Hasegawa PM (2002) Calcium modulates protease resistance and carbohydrate binding of a plant defense legume lectin, *Griffonia simplicifolia* lectin II (GSII). Comparative Biochem Physiol Part B 132:327-334

152. Yokoi S, Quintero FJ, Cubero B, Ruiz T, Bressan RA, Hasegawa PM, Pardo JM (2002) Differential expression and function of *Arabidopsis thaliana* NHX Na^+/H^+ antiporters in the salt stress response. Plant J 30:529-539

151. Koiwa H, Barb AW, Xiong L, Li F, McCully MG, Lee B-H, Sokolchik I, Zhu JH, Gong Z, Reddy M, Sharkhuu A, Manabe Y, Yokoi S, Zhu J-K, Bressan RA, Hasegawa PM (2002) C-terminal domain phosphatase-like family members (AtCPLs) differentially regulate *Arabidopsis thaliana* abiotic stress signaling, growth and development. Proc Natl Acad Sci (USA) 99:10893-10898

150. Xiong L, Lee H, Ishitani M, Tanaka Y, Stevenson B, Koiwa H, Bressan RA, Hasegawa PM, Zhu J-K (2002) Repression of stress-responsive genes by FIERY2, a novel transcriptional regulator in *Arabidopsis*. Proc Natl Acad Sci (USA) 99:10899-10904

149. Maggio A, Miyazaki S, Veronese P, Fujita T, Ibeas JI, Damsz B, Narasimhan ML, Hasegawa PM, Joly RJ, Bressan RA (2002) Does proline accumulation play an active role in stress-induced growth reduction? Plant J 31:699-712

148. Matsumoto TK., Ellsmore AJ, Cessna SG, Low PS, Pardo JM, Bressan RA, Hasegawa PM (2002) An osmotically induced cytosolic Ca^{2+} activates calcineurin signaling to mediate ion homeostasis and salt tolerance of *Saccharomyces cerevisiae*. J Biol Chem 277:33075-33080

147. Zhu J, Gong Z, Zhang C, Song CP, Damsz B, Inan G, Koiwa H, Zhu J-K, Hasegawa PM, Bressan RA (2002) OSM1/SYP61: A syntaxin protein in Arabidopsis controls abscisic acid-mediated and non-abscisic acid-mediated responses to abiotic stress. Plant Cell 14:3009-3028

146. Maggio A, McCully MG, Kerdnaimongkol K, Bressan RA, Hasegawa PM, Joly RJ (2002) Hydrogen peroxide and the ascorbic acid cycle are up-stream components in the ABA-mediated signal transduction system leading to stress-induced stomatal closure. Functional Plant Biol 29:845-852

145. Li X, Gong Z, Koiwa H, Niu X, Espartero J, Zhu X, Veronese P, Ruggiero B, Bressan RA, Weller SC, Hasegawa PM (2001) *Bar* expressing peppermint (*Mentha* X *Piperita* L., var. Black Mitcham) plants are highly resistant to the glufosinate herbicide Liberty. Mol Breeding 8:109-118

144. Maggio A, Consiglio F, Joly RJ, Hasegawa PM, Bressan RA (2001) Unraveling the functional relationship between root anatomy and plant salt tolerance. Austral J Plant Physiol 28:999-1004

143. Matsumoto TK, Pardo JM, Takeda S, Bressan RA, Hasegawa PM (2001) Tobacco and *Arabidopsis SLT1* mediate salt tolerance of yeast. Plant Mol Biol 45:489-500

142. Ibeas JI, Yun D-J, Damsz B, Narasimhan ML, Uesono Y, Ribas JC, Lee H, Hasegawa PM, Bressan RA, Pardo JM (2001) Resistance to the plant PR-5 protein osmotin in the model fungus *Saccharomyces cerevisiae* is mediated by the regulatory effects of SSD1 on cell wall composition. Plant J 25:271-280

141. Gong Z, Koiwa H, Cushman MA, Ray A, Bufford D, Kore-eda S, Matsumoto T, Zhu J, Cushman J, Bressan RA, Hasegawa PM (2001) Genes that are uniquely stress-regulated in salt overly sensitive (*sos*) mutants. Plant Physiol 126:1363-1375

140. Narasimhan ML, Damsz B, Coca MA, Ibeas JI, Yun D-J, Pardo JM, Hasegawa PM, Bressan RA (2001) A plant defense response effector induces microbial apoptosis. Mol Cell 8:921-930

139. Rus A, Yokoi S, Sharkhuu A, Reddy M, Lee B, Matsumoto TK, Koiwa H, Zhu J-K, Bressan RA, Hasegawa PM (2001) AtHKT1 is a salt tolerance determinant that controls Na^+ entry into plant roots. Proc Natl Acad Sci (USA) 98:14150-14155

138. Niu X, Li X, Veronese P, Bressan RA, Weller SC, Hasegawa PM (2000) Factors affecting *Agrobacterium tumefaciens*-mediated transformation of peppermint. Plant Cell Rep 19:304-310

137. Coca MA, Damsz B, Yun D-J, Hasegawa PM, Bressan RA, Narasimhan ML (2000) Heterotrimeric G-proteins of a filamentous fungus regulate cell wall composition and susceptibility to a plant PR-5 protein. Plant J 22:61-69

136. Koiwa H, Shade RE, Zhu-Salzman K, D'Urzo MP, Murdock LL, Bressan RA, Hasegawa PM (2000) A plant defensive cystatin (soyacystatin) targets cathepsin L-like digestive cysteine proteinases (DvCALs) in the larval midgut of western corn rootworm (*Diabrotica virgifera virgifera*). FEBS Lett 471:67-70

135. Ibeas JI, Lee H, Damsz B, Prasad DT, Pardo JM, Hasegawa PM, Bressan RA, Narasimhan ML (2000) Fungal cell wall phosphomannans facilitate the toxic activity of a plant PR-5 protein. Plant J 23:375-383

134. Koiwa H, Paino D'Urzo M, Zhu-Salzman K, Ibeas JI, Shade RE, Murdock LL, Bressan RA, Hasegawa PM (2000) An in-gel assay of a recombinant Western Corn Rootworm (*Diabrotica virgifera virgifera*) cysteine proteinase expressed in yeast. Anal Biochem 282:153-155

133. Hasegawa PM, Bressan RA, Zhu J-K, Bohnert HJ (2000) Plant cellular and molecular responses to high salinity. Annu Rev Plant Physiol Plant Mol Biol 51:463-499

132. Amaya I, Calle MDL, Medina MI, Heredia A, Botella MA, Hasegawa PM, Bressan RA, Quesada MA, Valpuesta V (1999) Transgenic tobacco overexpressing a basic peroxidase presents tolerance to osmotic stress during germination. FEBS Lett 457:80-84

131. Salzman RA, Fujita T, Zhu-Salzman K, Hasegawa PM, Bressan RA (1999) An improved RNA isolation method for plant tissues containing high levels of phenolic compounds or carbohydrates. Plant Mol Biol Rep 17:11-17

130. Li X, Niu X, Bressan RA, Weller SC, Hasegawa PM (1999) Highly efficient plant regeneration of Native Spearmint (*Mentha spicata* L.). In Vitro Cell Dev Biol-Plant 35:333-338

129. Xu P, Ling J, Li D, Hasegawa PM, Bressan RA (1999) Identification of a novel DNA binding protein to osmotin promoter. Science in China 1-8.

128. Niu X, Lin K, Hasegawa PM, Bressan RA, Weller SC (1998) Transgenic peppermint (*Mentha x piperita* L.) plants obtained by co-cultivation with *Agrobacterium tumefaciens.* Plant Cell Rep 17:165-171

127. Watad AA, Yun D-J, Matsumoto T, Niu X, Wu Y, Kononowicz AK, Bressan RA, Hasegawa PM (1998) Microprojectile bombardment-mediated transformation of *Lilium longiflorum*. Plant Cell Rep 17:262-267

126. Salzman RA, Tikhonova I, Abad LR, Hasegawa PM, Bressan RA, Bordelon BP (1998) Coordinately controlled accumulation of antifungal proteins and hexoses comprises a synergistic defense response in grape. Plant Physiol 117:465-472

125. Yun, D-J, Ibeas JI, Lee H, Coca MA, Narasimhan ML, Uesono Y, Hasegawa PM, Pardo JM, Bressan RA (1998) Osmotin, a plant antifungal protein, subverts signal transduction to enhance fungal cell susceptibility. Mol Cell 1:807-817

124. Zhu-Salzman K, Salzman RA, Koiwa H, Murdock LL, Bressan RA, Hasegawa PM (1998) Ethylene negatively regulates local expression of plant defense lectin genes. Physiol Plant 104:365-372

123. Xu P, Narasimhan ML, Samson T, Coca MA, Huh G-H, Zhou J, Martin GB, Hasegawa PM, Bressan RA (1998) A nitrilase-like protein interacts with GCC box DNA-binding proteins involved in ethylene and defense responses. Plant Physiol 118:867-874

122. Pardo JM, Reddy MP, Yang S, Maggio A, Huh G-H, Matsumoto T, Coca MA, Koiwa H, Yun D-J, Watad AA, Bressan RA, Hasegawa PM (1998) Stress signaling through the Ca^{2+}/Calmodulin-dependent protein phosphatase calcineurin mediates salt adaptation in plants. Proc Natl Acad Sci (USA) 95:9681-9686

121. Zhu-Salzman K, Shade RE, Koiwa H, Salzman RA, Narasimhan M, Bressan RA, Hasegawa PM, Murdock LL (1998) Carbohydrate binding and resistance to proteolysis control insecticidal activity of *Griffonia simplicifolia* lectin II. Proc Natl Acad Sci (USA) 95:15123-15128

120. Koiwa H, Shade RE, Zhu-Salzman K, Subramanian L, Murdock LL, Nielsen SS, Bressan RA, Hasegawa PM (1998) Phage display selection can differentiate insecticidal activity of soybean cystatins. Plant J 14:371-379

119. Casas AM, Kononowicz AK, Zehr UB, Zhang L, Haan TG, Tomes DT, Bressan RA, Hasegawa PM (1997) Approaches to the genetic transformation of sorghum. EUCARPIA

118. Maggio A, Bressan RA, Hasegawa PM, Locy RD (1997) Moderately increased constitutive proline does not alter osmotic stress tolerance. Physiol Plant 101:240-246

117. Ping X, Watad A, Yun D-J, Hasegawa PM, Bressan RA (1997) An expedient and reliable method to identify gene constructs in *Agrobacterium* vectors. Plant Tissue Culture Biotechnol 3:37-40

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22. Zhu JK, Hasegawa PM, Bressan RA (1997) Molecular aspects of osmotic stress in plants. Critical Rev Plant Sci 16:253-277

21. Koiwa H, Bressan RA, Hasegawa PM (1997) Expression of proteinase inhibitor genes-host plant/insect interaction. Trends Plant Science 2:379-384

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19. Zhu J-K, Bressan RA, Hasegawa PM (1995) Determination of protein isoprenylation in vitro and in vivo. p. 31-39. *In* Methods in Cell Biology-Plant Biology. Galbraith D, Bourque D, Bohnert H (eds), Academic Press, New York

18. Casas AM, Kononowicz AK, Bressan RA, Hasegawa PM (1995) Cereal transformation through particle bombardment. Plant Breeding Reviews 13:231-260

17. Kononowicz AK, Casas AM, Tomes DT, Bressan RA, Hasegawa PM (1995) New vistas are opened for sorghum improvement by genetic transformation. African Crop Science Journal 3:171-180

16. Kononowicz AK, Raghothama KG, Casas AM, Nelson DE, D Liu, Narasimhan ML, LaRosa PC, Singh NK, Bressan RA, Hasegawa PM (1994) Structure, regulation and function of the osmotin gene. p. 381-414. *In* Biochemical and Cellular Mechanisms of Stress Tolerance in Plants. Cherry JH (ed), NATO-ASI Series. Springer-Verlag. Berlin

15. Hasegawa PM, Bressan RA, Nelson DE, Samaras Y, Rhodes D (1994) Tissue culture in the improvement of salt tolerance in plants. p. 83-125. *In* Soil Mineral

Stresses. Approaches to Crop Improvement. Monographs on Theoretical and Applied Genetics, Vol. 21. Yeo AR, Flowers TJ (eds), Academic Press, London

14. Kononowicz AK, Raghothama KG, Casas AM, Reuveni M, Watad A-EA, Liu D, Bressan RA, Hasegawa PM (1993) Osmotin: Regulation of gene expression and function. p. 144-158. *In* Plant responses to cellular dehydration during environmental stress. Sixteenth annual Symposium in Plant Physiology. Close TJ, Bray EA (eds), American Association of Plant Physiologists, Rockville, MD.

13. Casas AM, Hasegawa PM (1992) Application of cell culture techniques to cereal improvement. *In* Biotechnology: Enhancing research on tropical crops in Africa. Thottappilly G (ed), International Institute of Tropical Agriculture, Ibadan, p. 117-126

12. Carpita NC, Iraki NM, Singh NK, Bressan RA, Reuveni M, Binzel M, LaRosa PC, Nelson D, Rietveld R, Schnapp S (1990) Cellular mechanisms of salt and water stress tolerance in plants. Scientia Hort 280:341-352

11. Bressan RA, Nelson DE, Iraki NM, LaRosa PC, Singh NK, Hasegawa PM, Carpita NC (1990) Reduced cell expansion and changes in cell walls of plant cells adapted to NaCl. p. 137-171. *In* Environmental injury to plants. Katterman FJ (ed.), Academic Press, New York

10. Hasegawa PM, Binzel ML, Reuveni M, Watad AA, Bressan RA (1990) Physiological and molecular mechanisms of ion accumulation and compartmentation contributing to salt adaptation of plant cells. p. 295-304 *In* Horticulture Biotechnology Symposium. Plant Biology Series. Bennett AB, O'Neill SD (eds), A. R. Liss, New York

9. Binzel ML, Hess FD, Bressan RA, Hasegawa PM (1989) Mechanisms of plant adaptation to salinity in cultured glycophyte cells. p. 139-157. *In* Biochemical and physiological mechanisms associated with environmental stress tolerance in plants. Cherry JH (ed), Springer-Verlag, Berlin

8. Singh NK, Nelson D, LaRosa PC, Hasegawa PM, Bressan RA (1989) Osmotin: a thaumatin-like protein associated with osmotic stress adaptation in plant cells. p. 67-87. *In* Biochemical and physiological mechanisms of tolerance to environmental stress. Cherry JH (ed), Springer-Verlag, Berlin

7. Singh NK, Iraki N, Hasegawa PM, Carpita NC, Bressan RA (1989) Reduced growth rate and changes in cell wall proteins of plant cells adapted to NaCl. p. 173-194. *In* Biochemical and physiological mechanisms of tolerance to environmental stress. Cherry JH (ed), Springer-Verlag, Berlin

6. Bressan RA, Nelson DE, Iraki NM, LaRosa PC, Singh NK, Hasegawa PM, Carpita NC (1989) Reduced cell expansion and changes in cell walls of plant cells adapted to NaCl. p. 137-171. *In* Environmental Injury to Plants. Katterman FJ (ed), Academic Press, New York

5. Bressan RA, Singh NK, Handa AK, Mount R, Clithero J, Hasegawa PM (1987) Stability of altered genetic expression in cultured plant cells adapted to salt. p. 41-57 *In* Drought resistance in plants. Physiological and genetic aspects, Monti L, Porceddu E (eds), Commission of the European Communities. Brussels

4. Rietveld RC, Hasegawa PM, Bressan RA (1987) Genetic variability in tuber disc-derived potato plants. p. 392-407. *In* Biotechnology in agriculture and forestry. Vol. 3: Bajaj YPS (ed), Potato, Springer-Verlag, Berlin

3. Hasegawa PM, Bressan RA, Handa AK (1986) Cellular mechanisms of salinity tolerance. ASHS Symposium on Basic Research Ideas and Opportunities for Horticulturists in Stress Physiology. HortScience 21:1317-1324

2. Bressan RA, Singh NK, Handa AK, Kononowicz A, Hasegawa PM (1985) Stable and unstable tolerance to NaCl in cultured tobacco cells. p. 755-769. *In* Genetics Freeling M (ed), UCLA Symposium on Plant A. R. Liss, Inc. New York

1. Hasegawa PM, Bressan RA, Handa S, Handa AK (1984) Tolerance to water stress in higher plant cells. HortScience 19:371-377

Books Edited:

3. Altman A, Hasegawa PM (eds) (2010) Plant Biotechnology 2010: Basic Aspects and Agricultural Implications. Elsevier Publishing (in preparation)

2. Jenks MA, Hasegawa PM, Jain SM (eds) (2007) Advances in Molecular Breeding toward Drought and Salt Tolerant Crops Springer p. 817

1. Jenks MA, Hasegawa PM (2005) Plant Abiotic Stress. Jenks MA, Hasegawa PM (eds) Blackwell Publishing

7. Invited Presentations, Lectures, etc.:

Metabolic phenomena associated with initiation of organized structures in vitro. Tissue Culture Association, 28th Annual Meeting, 1977

Propagation of woody plants by tissue culture techniques. Iowa State University 20th Annual Shade Tree Short Course, 1977

Tissue culture today and in the future. International Plant Propagator's Society, Inc. Southern Region, 3rd Annual Meeting, December, 1978

Shoot tip excision and culture to plants. Workshop on practical tissue culture techniques and problems. ASHS Annual Meeting, 1980

Plant tissue culture. Stauffer Chemical Company, Richmond, CA, February 13, 1980

Plant tissue culture and crop productivity. The Alpha Zeta-Gamma Delta Sigma Faculty Discussion Series, Purdue University, April 8, 1981

The involvement of plant growth regulators in growth and differentiation in vitro. U. S. - Taiwan Seminar on Plant Growth Regulators, NSF/NSC, June 22-24, 1981

Regulation of morphogenesis in vitro. Oregon Graduate Center, Beaverton, OR, July 13, 1981

Application of tissue culture to horticultural crops. Molecular Genetics, Inc., Minneapolis, MN, August 24, 1981

Morphogenesis in vitro. Native Plants, Salt Lake City, UT, September 22, 1981

Plant tissue culture research at Purdue University. Calgene, Inc., Davis, CA, October 15, 1981

Regulation of morphogenesis in vitro. Department of Pomology, University of California, Davis, CA, November 12, 1981

Tissue culture. Minicourse on plant cell and molecular biology. University of Utah, Salt Lake City, UT, February 24-27, 1983

Salt and drought stress tolerance in cultured higher plant cells. University of Chapingo, Chapingo Mexico, May 12, 1983

Salt tolerance in cultured plant cells. Biological responses to stress in plants. Tissue Culture Association, 34th Annual Meeting, June 14, 1983

Tolerance to water stress in higher plant cells. Symposium on: Somatic cells genetics: Prospects for development of stress tolerance. ASHS, 80th Annual Meeting, October 19, 1983

Mechanisms of tolerance to salt in cultured cells. Plant Breeding and Genetics Program, Michigan State University, East Lansing, MI, February 24, 1984

Utilizing cell cultures to study cellular mechanisms of salinity and water stress tolerance in plants. Symposium on: Biotechnologies to unlock resources of arid land plants. AAAS Annual Meeting, New York, NY, May 24-29, 1984

Osmotic adjustment. Gordon Research Conference on Temperature Stress in Plants, Tilton Academy, NH, June 24-29, 1984

Cellular mechanisms of salinity tolerance. University of Illinois, Urbana, IL, February 18, 1985

Physiological and biochemical adaptations contributing to salinity tolerance. Department of Botany, The Hebrew University of Jerusalem, Jerusalem, Israel, March 28, 1986

Osmotic stress tolerance in plants through in vitro and molecular approaches. ECC Conference on Drought Resistance in Plants: Genetic and Physiological Aspects. Amalfi, Italy, October 20-23, 1986

Cellular mechanisms of salinity tolerance in cultured glycophyte cells. Israel Association of Plant Tissue Culture and Israel Society of Plant Molecular Biologists. Weizmann Institute of Science, Rehovot, Israel, November 20, 1986

Mechanisms of salinity tolerance of glycophyte cells in vitro, CIBA-Geigy Biotechnology Research, Research Triangle, NC, February 3, 1987

Biotechnology use on cowpea, IITA Workshop on "Host plant resistance to post-flowering pests of cowpea", Ibadan, Nigeria, September 5-11, 1987

Salt adaptation of cultured glycophyte cells, University of Granada, Granada, Spain, October 20, 1987

Stability of salt tolerance in adapted cells and regenerated plants, Moet-Hennessey conference on "Advanced selection strategies: Potential applications for the breeding of woody species", Versailles, France, September 18-20, 1988

Phenotypic stability of salt tolerance in cells and regenerated plants, Bio Symposium Tokyo '88, Tokyo, Japan, October 19-22, 1988

Interspecific hybridization for insect resistance. Cowpea Biotechnology Conference, Portici, Italy, June 14-16, 1989

Intracellular ion accumulation and compartmentation mechanisms contributing to salt adaptation. Horticulture Biotechnology Symposium, Davis, CA, August 20-23, 1989

Osmotic regulation of ATPase genes. Joint Cowpea Biotechnology Workshop, Purdue University, July 16-20, 1990

Cowpea transformation systems for bioassaying insect resistance genes and to obtain transgenic plants. Joint Cowpea Biotechnology Workshop, Purdue University, July 16-20, 1990

Ion accumulation and compartmentation mechanisms contributing to osmotic adjustment required for salt adaptation of plant cells, Department of Botany and Microbiology, Auburn University, October 9, 1990

Cereal regeneration. Biotechnology: Enhancing Research on Tropical Crops in Africa, Ibadan, Nigeria, November 26-30, 1990

Cowpea Biotechnology Workshop, University of Naples, June 24-26, 1991

Osmotic regulation of osmotin. March Foundation Conference, Madrid, Spain, November 11-13, 1991

Physiological and molecular mechanisms of ion accumulation and compartmentation contributing to salt adaptation. University of Malaga, May, 1991

NaCl regulation of plasma membrane and tonoplast ATPase gene expression in glycophytes and a halophyte during salt adaptation. Ninth International Workshop on Plant Molecular Biology, Monterey, CA, July 19-24, 1992

Callus feeding bioassay. Cowpea Biotechnology Workshop, Bari, Italy, June 29-July 1, 1992

Physiological and molecular mechanisms of salt adaptation. Symposium on Applications and Prospects of Biotechnology for Arid and Semi-Arid Lands. Lubbock, TX, November 5-7, 1992

Osmotin: regulation of gene expression and function. Plant Responses to Cellular Dehydration During Environmental Stress, 16th Annual Symposium on Plant Physiology, University of California-Riverside, January 28-30, 1993

ATPase gene expression during salt stress. Plant Molecular Biology Gordon Research Conference, Andover, NH, July 5-9, 1993

Genetic transformation of cowpea. Joint Cowpea Biotechnology Workshop, Purdue University, September 27 to 29, 1993

NaCl regulated gene expression. Gordon Conference - Salinity Tolerance in Plants, Tilton, NH, August 14 to 19, 1994

Osmotic regulation of plant ATPase gene expression. Fifth International Symposium-Genetics and Molecular Biology of Plant Nutrition, July 17 to 24, 1994

Developing a transformation system for cowpea (*Vigna unguiculata* L. Walp.). Second World Cowpea Research Conference, Ibadan, Nigeria, September 4 to 10, 1994

Osmotin mediated host plant phytopathogenic fungal resistance - Cucurbitaceae 94, South Padre Island, TX, November 1 to 4, 1994

Microprojectile transformation of sorghum - 19th Biennial Grain Sorghum Research and Utilization Conference, Lubbock, TX, March 1 to 7, 1995

Improvement of abiotic and biotic stress tolerance in plants by molecular genetic approaches - Department of Biology, Humboldt State University, September 14, 1995

Plant transformation; Plant Biotechnology - Department of Biology, Humboldt State University, September 3, 1996

Wheat PR-4 and trypsin inhibitor effectively inhibit *Aspergillus flavus*, Aflatoxin Elimination Workshop, Fresno, CA, October 28-29, 1996

Verticillium resistance in mint via plant biotechnology, Mint Industry Research Council, Scientific Affairs Committee, Las Vegas, NV, January 22, 1997

Plant transformation (BIOL 542) - Department of Biological Sciences, Humboldt State University, Arcata, CA, October 5-21, 1997

Plant biotechnology - Department of Biological Sciences, Humboldt State University, Arcata, CA, October 15, 1997

Plant stress tolerance - Cell and molecular biology, Humboldt State University, Arcata, CA, October 16, 1997

Identification of plant osmotic stress tolerance determinants - Department of Biology, IUPUI, Indianapolis, IN, November 14, 1997

Crop improvement of mint through biotechnology, Mint Industry Research Council Annual Meeting, Las Vegas, NV, January 14, 1998

Identification of plant salt tolerance determinants, RITE International Workshop on Metabolic Engineering of Plants, Kyoto, Japan, June 5, 1997

Osmotic stress tolerance determinants, Symposium on Abiotic Stress Tolerance at the International Association of Plant Tissue Culture Meeting, Jerusalem, Israel, June, 1998

Abiotic stress tolerance of plants, Symposium at the Horticulture Society Meeting, Charlotte, NC, July, 1998

Salt regulated plant genes, Salinity and Water Stress Gordon Conference, Oxford, UK, August, 1998

Plant Transformation in Biotechnology (BIOL 542) - Department of Biological Sciences, Humboldt State University, Arcata, CA, October 21 to November 14, 1998

Plant Genomics, HLA Department, Purdue University, October, 1998

Molecular determinants of stress tolerance in plants, Colloquium on Linking Molecular Processes to Horticultural Performance, American Society for Horticultural Science Annual Meeting, Charlotte, NC, July 12-15, 1998

Function of genes implicated in stress tolerance, Session on Ionic Relations, Salinity and Water Stress Gordon Conference, Oxford, UK, August 16-21, 1998

Salt tolerance determinants of plants, Department of Botany and Microbiology, Auburn University, October 16, 1998

Salinity stress tolerance of plants, Institute of Cell and Molecular Biosciences, University of Tokyo, December 1, 1998

Production technology for environmental compatibility: Technology development for renewable industrial materials production by plants adapted to stressful environments, Plant Biotechnology in the 21st Century, Nara Institute of Science and Technology Workshop, December 2-3, 1998

Signal transduction and salinity tolerance, Mechanisms of Plant Responses to Salt and Drought Stresses, Japanese Ministry of Education, Science, Culture and Sports, Honolulu, HI, January 14-16, 1999

Crop improvement of mint through biotechnology, Mint Industry Research Council Annual Meeting, Las Vegas, NV, January 19-21, 1999

Salt tolerance determinants, Plant Tolerance to Abiotic Stresses in Agriculture: Role of Genetic Engineering, NATO ARW, Mrogowa, Poland, June 13-19, 1999

Plant tissue culture and biotechnology (BOT 520), Department of Biological Sciences, Humboldt State University, March 31-May 7, 1999

Directed molecular evolution of plant defensive proteins, Institute of Food Technologists Annual Meeting, July 24-28, 1999

Plant genomics, Department of Biological Sciences, Humboldt State University, Arcata, CA, November 5, 1999

Ca^{2+} signaling in the osmotic stress response. 6th International Society of Plant Molecular Biology Meeting, Quebec, Canada, June 18-24, 2000

Searching for *Verticillium* resistance determinants - Mint Industry Research Council Annual Meeting, Las Vegas, NV, January 16-18, 2001

Osmotic signaling and plant stress adaptation, Department of Plant Sciences, University of Arizona, Tucson, AZ, February 5, 2001

Genetic approaches to identification of plant osmotic stress tolerance determinants, Department of Plant Biology, Arizona State University, Tempe, AZ, February 9, 2001

Plant osmotic stress tolerance determinants, Volcani Center, Bet Dagan, Israel, February 27, 2001

Arabidopsis and yeast as genetic models to dissect the plant response to salt, School of Biological Sciences, University of Sussex, March 1, 2001

AtHKT1 is a salt tolerance determinant that controls Na^+ entry into plant roots, 12th International Workshop on Plant Membrane Biology, Madison, WI, August 11-16, 2001

Plant osmotic stress tolerance determinants by T-DNA tagging mutagenesis in Arabidopsis, Central Power Industries Research Institute, Abiko, Japan, October 25, 2001

Cellular and plant responses to salinity: Tolerance determinants identified by T-DNA tagging mutagenesis in Arabidopsis, Yamada Symposium, Kyoto, Japan, November 5-6, 2001

Physiological, biochemical and genetic analyses of ion homeostasis during salinity stress, Academia Sinica Symposium, Taipei, Taiwan, November 8-10, 2001

Plant osmotic stress tolerance determinants identified by T-DNA tagging in Arabidopsis, University of Tokyo, Japan, November 21, 2001

Genetic approaches to identify plant osmotic stress tolerance determinants, including effectors of ion homeostasis – Research Institute for Bioresources, Okayama University, Japan, December 11, 2001

Plant stress tolerance determinants identified by T-DNA insertional tagging in *Arabidopsis thaliana*, Hiroshima University, Japan, December 13, 2001

Signaling and effector determinants of salt tolerance, Tohoku University, Japan, December 20, 2001

Osmotic stress tolerance determinants identified by T-DNA mutagenesis of *Arabidopsis thaliana*, Agricultural Plant Research Center, Chonnam, Korea, January 14, 2002

Osmotic stress tolerance determinants identified by T-DNA mutagenesis of *Arabidopsis thaliana*, Agricultural Plant Research Center, Gyeongsang University, Korea, January 15, 2002

Ion homeostasis mechanisms that contribute to plant stress tolerance, Nara Institute of Research and Technology, Japan, January 18, 2002

Plant salt stress tolerance determinants identified by insertional T-DNA tagging, XIIIth International Conference on Arabidopsis Research, Seville, Spain, June 28-July 2, 2002

Introduction by the Chair, Salt and Water Stress in Plants Gordon Research Conference, Oxford, UK, July 14-19, 2002

Plant salt stress tolerance determinants identified by T-DNA tagging, Abiotic Stress Workshop, Rockefeller Foundation and Shandong Teacher's University, Jinan, PRC, October 9-11, 2002

Plant stress tolerance determinants, Institute of Botany, Academia Sinica, Beijing, PRC, October 14, 2002

Salt stress tolerance in plants, Beijing Forestry University, Beijing, PRC, October 15, 2002

Plant salt stress adaptation determinants identified by T-DNA insertional tagging, Plant Breeding and Genetics Program, Michigan State University, East Lansing, MI, December 13, 2002

Plant stress adaptation determinants identified by T-DNA insertional tagging, Molecular and Cell Biology Division, NSF, Arlington, VA, December 20, 2002

Plant stress adaptation determinants identified by T-DNA insertional tagging, USDA Salinity Laboratory, Riverside, CA, January 29, 2003

Salt and freezing tolerance determinants of plants, Plant and Animal Genome Conference XII, Abiotic Stress Workshop, San Diego, CA, January 10-15, 2004

Forward genetic approaches for the identification of salt adaptation determinants, Keystone Symposium on Plant Responses to Abiotic Stresses, Santa Fe, NM, February 19-25, 2004

Cold and osmotic stress signaling determinants in Arabidopsis, 7th International Plant Cold Hardiness Seminar, Hokkaido University, Sapporo, Japan, July 10, 2004

Salt tolerance determinants identified by forward genetic approaches, First Annual Australian Center for Plant Functional Genomics Research Symposium and Project Review, Barossa, South Australia, October 5-9, 2004

Cross talk between temperature stress and other environmental stresses, Discussion Leader, Gordon Research Conference on Temperature Stress in Plants, Ventura, California, January 29 to February 4, 2005

Plant osmotic stress tolerance determinants, Research Coordination Meeting – Crop Tolerance to Salt and Drought for FAO/International Atomic Energy Agency, Vienna, Austria, March 14-18, 2005

Forward genetic approaches for identification of plant osmotic stress tolerance determinants, MEPS Symposium, Texas A&M University, College Station, Texas, March 6-9, 2005

Osmotic stress tolerance determinants of Arabidopsis, Plant salt tolerance and breeding (cellular and whole plant response), International Salinity Forum, University of California Water Resources Center, Riverside, CA, April 25-27, 2005

Osmotic stress tolerance determinants identified by forward genetic approaches, Institute of Genetics, Beijing, China, April 30 to May 4, 2005

Sumoylation in phosphate signaling and stress tolerance of plants, Plant Stress Biology Symposium, Busan, Korea, May 4-7, 2005

Salt and osmotic stress tolerance determinants of Arabidopsis, Symposium on plant responses to salinity, Barcelona, Spain, July 9-15, 2005

Plant responses to abiotic stresses, Universidad de Malaga, Malaga, Spain, March 29, 2006

Plant responses to abiotic stresses, Estacion Experimeiintal del Zaidin, Granada, Spain March 30, 2006

Plant responses to abiotic stresses, Instituto de Recursos Naturales y Agrobiologia, Sevilla, Spain, April 3, 2006

Plant responses to abiotic stresses, Universidad de Cordoba, Cordoba, Spain, April 5, 2006

Plant responses to abiotic stresses, INIA, Madrid, Spain, April 7, 2006

Sumoylation in plant responses to abiotic stresses, Gordon Research Conference on Salt and Water Stress in Plants, Magdalen College, Oxford, UK, September 3-8, 2006

Sumoylation regulates plant responses to abiotic stresses, Iwate Plant Science Symposium 2006, Morioka, Japan, October 17-21, 2006

Plant responses to abiotic stresses, Colorado State University, Ft. Collins, CO, November 7-12, 2007

Sumoylation in plant responses to abiotic stresses, University of California, Riverside, December 13-16, 2007.

Program co-chair MARD symposium: Frontiers in Agriculture – Biotic and abiotic stress in plants, Amman, Jordan – November 1-13, 2008

Keynote speaker 2: Plant responses to salinity and water deficit, MARD symposium: Frontiers in Agriculture – Biotic and Abiotic Stress in Plants, Amman, Jordan – November 1-13, 2008

Sumoylation and plant responses to abiotic stresses - Faculty of Agriculture, Hebrew University of Jerusalem, November, 2008

Sumoylation in plant responses to abscisic acid (ABA) and abiotic stresses, National Science Foundation, Division of Molecular & Cellular Biosciences, Washington, DC, February 6, 2009

1st Conference on Biotechnology Research and Application in Palestine: Keynote Talk – Adaptation and tolerance to salinity. Bethlehem University, April 3-4, 2009

Bethlehem Workshop: Agrobacterium mediated genetic transformation in plants. May 2, 2009

USDA Lab: Plant responses to abiotic stresses. Hilo, HI, May 22, 2009

Plants for the Future Plenary Speaker: Sumoylation in plant responses to abiotic stresses. Leipzig, Germany, June 8, 2009

NSF-PSI-1 Proposal Panel Review, Washington, DC, October 20-23, 2009

9th International Plant Molecular Biology Congress: Sumoylation in plant responses to low temperatures and ABA. St. Louis, MO, October 26, 2009

Plant responses to salinity management integrated water resource and plant water stresses. Amman, Jordan, March 13-17, 2010

AtGTL1 regulates transpiration and water-use efficiency by controlling stomatal number through transcriptional repression of *SDD1*. China Agricultural University, Beijing, April 11-12, 2010

AtGTL1 regulates transpiration and water-use efficiency by controlling stomatal number through transcriptional repression of *SDD1*. Institute of Genetics, Beijing, April 13, 2010

AtGTL1 regulates transpiration and water-use efficiency by controlling stomatal number through transcriptional repression of *SDD1*. Institute of Botany, BeijingApril 14, 2010

AtGTL1 regulates transpiration and water-use efficiency by controlling stomatal number through transcriptional repression of *SDD1*. Tsinghua University, BeijingApril 15, 2010

AtGTL1 regulates transpiration and water-use efficiency by controlling stomatal number through transcriptional repression of *SDD1*. Tsukuba University, Japan, April 19, 2010

AtGTL1 regulates transpiration and water-use efficiency by controlling stomatal number through transcriptional repression of *SDD1*. Kyoto University, Japan, April 22, 2010

Protein trafficking, salinity and drought – Gordon Research Conference, Switzerland – June 13-18, 2010

Sumoylation in plant responses to abiotic stresses, British Society for Experimental Biology. Prague – June 30-July 3, 2010

Plant biotechnology, Lecture at Bethlehem University – September 25, 2010

Salinity and drought tolerance determinants of plants, Palestinian Biotechnology Conference, Al'Najah University, Nablus – September 26-27, 2010

AtGTL1 regulates transpiration and water-use efficiency by controlling stomatal number through transcriptional repression of *SDD1,* Cell biology and Molecular Genetics Department, University of Maryland, College Park – March 18, 2011

8. Graduate Students, Post Doctorates and Visiting Scientists:

A. Graduate Students (completed):

EA Frankenburger. Genetics of shoot-forming capacity in tomato. M.S. 1980

PC LaRosa. Carbon metabolism in photoautotrophic cells of potato. M.S. 1982

MC Lopez-Peralta. Tolerance of tomato genotypes to osmotic stress in vitro. Ph.D. 1984 (Co-major Professor with RA Bressan)

Marla L. Binzel. Ion transport properties associated with adaptation to salt stress in tobacco cells. Ph.D. 1987

Sherry Rae Schnapp. Carbon use efficiency of salt adapted cells. Ph. D. 1988

Jian-Kang Zhu. Plant cell surface adhesion proteins. Ph.D. 1993

Xiaomu Nui. Regulation of the 70 kDa subunit tonoplast ATPase gene by NaCl. Ph.D. 1994

Tracie Matsumoto. Molecular genetics of salt adaptation. Ph.D. 1999

Altanbradt Sharkuu. Suppressors of the salt sensitive phenotype of *sos3*. M.S. 2002

Xiangqiang Zhan. Forward genetic approaches in the halophyte *Thellungiella*. Ph.D. 2009

Chan Yul Yoo. Calmodulin-dependent transcription factors. Ph.D. 2011

B. Postdoctorate Associates/Visiting Scientists/Undergraduate Students (including collaborations):

VC Pence 1977-1980
A.K. Handa 1979-1981
S Handa 1980-1987
M Jain 1981-1982
NK Singh 1982-1987
SS Singh 1984-1985
D Charles 1985-1987
C Orser 1985-1987
J Kanabus 1985-1987
M Reuveni 1985, 1987-1989, 1992-1993
M Binzel 1987-1989
A Casas 1988-1993
J Hanquier 1988-1990
KG Raghothama 1990-1992
Chima Osuala 1991-1992
Sherry Schnapp 1989-1992
Yuan Zhao 1993-1995
S Grillo 1991
Chris LaRosa 1991-1993
Meena Narasimhan 1992-2006
U Zehr 1992-1994
Josef Kapusta 1993-1994
Laura Todd 1994-1995
Dae-Jin Yun 1994-1998
Miguel Angel Botella - 1991, 1993, 1994-1995
Eva Perez-Pratt, University of Malaga, Spain - 1988-1990

A Kononowicz, University of Lodz, Poland - 1985, 1990-1997
Y-J Kim, Korean Faculty of Agriculture - 1980-1982
Oyette Chamblis, Auburn University - 1990
MP D'Urzo, Faculture of Agriculture, Italy - 1991, 1993-1995
Jose M. Pardo, Natural Science and Agriculture Research Institute, Seville, Spain - 1992, 1993-1994, 1995-1997
Franco Saccardo, University of Tuscany, Viterbo, Italy - 1991
Tykal N. Prabha, India - 1992
Louis Jackai, IITA, 1991-1992
Imelda M. Mendoza, Spain - 1993-1994, 1995-1997
Abd Watad, Volcani, Israel - 1994, 1995-1996
Kheng T. Cheah, Malaysia - 1994-1995
Rafael Prieto, University of Cordoba, Spain - 1994-1996
Yongquin Niu, Chinese Academy of Sciences, Beijing - 1994-1995
Barbara Damsz, University of Lodz, Poland - 1993-2001
Satomi Takeda, Osaka Womens University, Osaka - 1994-1995
Joaquin Espartero, University of Seville, Spain - 1994-1995, 1996
Ping Xu, Zhejiang Agriculture University, China - 1994-1996
Iraida Amaya, Spain - 1994-1995
Amir Zuker, Volcani, Israel - 1994
Mansi Wang, Nanjing University, China - 1994-1996
Lanying Zhang, South China Institute of Botany, China - 1994-1997
Xia Li, Hebei Teacher's University, China - 1996-2002
Zihong Fan, China - 1994-1995
Jiamin Li, Institute of Agriculture, Schijiazhuang, China - 1995
Mahmoud Hamoui, University of Damascus, Syria – 1995
Kui Lin - 1996-1997
Hisashi Koiwa - 1996-2002
Mupala Reddy, Salinity Research Institute, India - 1996-1997, 1999-2000
Maria Coca, Consejo Superior de Investigaciones Cientificas, Sevilla, Spain - 1997-2000
Ignacio Ibeas - 1996-2000
Keyan Zhu-Salzman - 1995-2000
Yoshikiyo Sakabibara, National Food Research Institute, Tskuba, Japan - 1996
Bahagiawati Amirhusin, Indonesia - 1996-2000
Gabriele Chilosi, University of Tuscany - Italy, 1996
Carla Caruso, University of Tuscany - Italy, 1997
Paola Veronase, Rome, Italy - 1996-1997, 1998-2002
Gyung-Hye Huh - 1997-2000
Shuji Yokoi - 1999-2001
Ana Rus - 1998-2004
Zhizhong Gong - 1999-2000
Fang Li - 2000-2001
Tracie Matsumoto - 1998-2001
Fumiyuki Goto - 2001-2003
Yuko Nakagawa - 2001-2003
Kenji Muira – 2002-2008
Dae-Jin Yun – 2003-2005

Abel Rosado-Rey – 2003-2004
Jingbo Jin – 2004-2008
Dong Won Baek – 2003-2004
Ziyi Cao – 2003-2004
Jael Cheol Jeong – 2003-2006
Yinhua Jin – 2004-2008
Suk-Yoon Kim – 2004-2005
Kuk-Yoon Kwon – 2004-2005
Yanmei Zhu – 2004-2008
Chan Yul Yoo – 2004-2005
Xiangqiang Zhan – 2004-2005
Jianjun Zhu – 2005-present
Ji Young Lee – 2005-2007
Fernando Alemán Guillén – 2008
Angie Moon – 2009
Meg Knapke – 2009 - present
Hua Wang – 2009-present
Eugene Parsons – 2010- 2011
Chan Yul Yoo – 2012-

9. Research Grants/Support:

Selection of disease resistance in maize and potato through the use of tissue culture. AES Program Improvement Funds. January 1, 1979 - December 31, 1981. $180,000 (Hasegawa PM, Nicholson RL, Bressan RA).

In vitro production of cacao. Chocolate Manufacturers Association, April 1, 1980 - March 31, 1983, $570,000 (Janick J, Hasegawa PM)

Studies on the biochemical and genetic control of linolenic acid synthesis in developing soybean seeds. American Soybean Association, March 1, 1980 - February 28, 1985, $114,000 (Cherry J, Hasegawa PM)

Resistance to water and salt stress through somatic cell selection. BARD, October 1980 - October 1983, $105,000 to Horticulture. (Bressan RA, Hasegawa PM, Handa AK)

Plant cell and tissue culture research. AES Program Improvement Funds, July 1, 1981 - July 1, 1984, $90,000 (Hasegawa PM, Bressan RA, Handa AK)

Tissue culture propagation of rose. Michigan Bulb Company, November 1, 1981 - October 31, 1982, $5,500

Salt stress tolerance in plants. Native Plants, Inc., September, 1982, $10,000 (Handa AK, Bressan RA, Hasegawa PM)

Regulation of protein and mRNA metabolism in salt tolerant and intolerant cultured higher plant cells. DOE, 1983-1986, $240,000 (Bressan RA, Hasegawa PM, Handa AK)

Development of tissue culture systems to produce important plant secondary products. Showalter Trust Fund, April 1, 1983-June 30, 1984, $30,000 (Heinstein P, Bressan RA, Hasegawa PM, Handa AK)

Role of ion accumulation and compartmentation in salinity adaptation of cultured cells. USDA/NRICGP, August 1, 1985-July 31, 1988, $150,000 (Hasegawa PM, Hess FD)

Purchase of equipment for plant stress biology research. NSF, $75,000 (Bressan RA, Cherry JH, Handa AK, Mitchell CA, Weller SC, Hasegawa PM)

Membrane transport adaptations contributing to salinity tolerance. Cultured cells and regenerated plants. BARD, December 1, 1986-November 31, 1988, $100,000 (Hasegawa PM, Hess FD, Israeli collaborators)

Cowpea PSG/IPIA. July 1, 1987-June 30, 1989, $57,000 (Bressan RA, Hasegawa PM)

Incorporation of resistance to pod borer and pod bugs into cowpea. AID/USDA/CSRS Collaborative Research on Special Constraints at the IARC's, July 1, 1988-June 30, 1991, $90,000 (Hasegawa PM, Bressan RA, Kitch L, Shade RE, Murdock L)

Interspecific hybridization of cowpea, cowpea transformation. IITA, January 1, 1989-December 30, 1992, $180,000 (Bressan RA, Hasegawa PM)

Mechanisms contributing to enhanced tonoplast ATPase activity during adaptation of plant cells to salinity. David Ross Grant, January 1, 1990-December 31, 1992, $16,000

Regulation of the plasma membrane and tonoplast H^+-ATPases in plants exposed to NaCl. Royal Society Guest Research Fellowship, January 1, 1990, $20,000

Alternatives to enhance cowpea as a source of protein nutrition, a component of the NSCORT project. NASA, November 1990-November 1994, $380,000 (for Hasegawa PM, Bressan RA)

Transfer of osmotically (drought and salt stress) regulated genes to rice. Rockefeller Foundation, 1990-1993, $30,000 (Hasegawa PM, Bressan RA)

Regulation of the plasma membrane and tonoplast H^+-ATPases in plants exposed to NaCl. NSF - Cooperative Science Program, 1991-1992, $14,000

Molecular cloning of soybean cysteine proteinase inhibitor for insect resistance. USDA/NCRIGP, September 9, 1991-August 31, 1995, $195,000 (Nielsen S, Hasegawa PM, Bressan RA)

Sorghum transformation. Pioneer Seed Company, January, 1992-September, 1994, $283,000, (Hasegawa PM, Bressan RA, Butler L, Axtell J)

Characterization of morphological, physiological and biochemical mechanisms associated with drought resistance in *Sorghum bicolor*. McKnight Foundation, July1,

1990-June 30, 1993, $62,000, renewal from January 1992-Janaury, 1995, $62,000 (Hasegawa PM)

Regulation of H^+-ATPase genes in a glycophyte and a halophyte. USDA/NCRIGP, July 1, 1992-June 30, 1995, $120,000 (Hasegawa PM, Bressan RA)

The possible involvement of extracellular matrix proteins in cell wall/membrane adhesion and in Ca/calmodulin regulated metabolism of plant cells adapted to osmotic stress. USDA/NCRIGP, July 1, 1992-June 30, 1995, $120,000 (Bressan RA, Hasegawa PM)

Osmotin, a novel source of phytopathogenic fungal resistance. Midwest Plant Biotechnology Consortium (DOE), January 1, 1993-December 31, 1994, $200,000 (Hasegawa PM, Bressan RA)

Resistance to aflatoxin producing *A. flavus* group fungi in transgenic peanut plants overproducing osmotin and osmotin-like proteins. USDA Cooperative, 1993-1998 $101,000 (Bressan RA, Hasegawa PM)

Osmotin and osmotin-like proteins, novel sources of phytopathogenic fungal resistance for tomato, carnation and petunia. BARD, 1993-1995, $50,000 (Hasegawa PM, Bressan RA, Watad AA)

Functional analysis of ANJ1, a higher plant homolog of the bacterial heat shock protein and molecular chaperone DnaJ. PRF Grant, July, 1994-June, 1996, $20,400

Sorghum transformation. Pioneer Seed Company, October, 1994-September, 1997, $641,000 (Hasegawa PM, Bressan RA)

Co-ordinate regulation and function of osmotically-induced plant defense genes. USDA/NRICGP, 1994-1997, $149,000 (Bressan RA, Hasegawa PM)

Development of a sorghum transformation system. Consortium for Plant Biotechnology Research (DOE), January, 1994-December, 1995, $50,000 (Hasegawa PM, Bressan RA)

ANJ1 proteins, a novel class of plant DnaJ-like chaperones that are involved in thermal adaptation. USDA/NRICGP, 1995-1998, $170,000 (Hasegawa PM, Bressan RA)

Sorghum stem borer and root and stalk rot disease resistance through genetic transformation. Rockefeller Foundation - 1996-1997 - $60,000 (Hasegawa PM, Bressan RA)

Sorghum transformation. Pioneer Hi-Bred International - 1996-1997 - $240,000 (Hasegawa PM, Bressan RA)

Exploiting antifungal protein and commercial fungicide synergisms to reduce fungicide use. USDA Biotech program - 1996-1998 - $150,000 (Bressan RA, Hasegawa PM, Narasimhan ML)

Utilization of cysteine proteinase inhibitors for host plant insect resistance. USDA Biotech program, 1996-1998, $90,000 (Hasegawa PM, Bressan RA)

Osmotin and osmotin-like proteins, novel sources of phytopathogenic fungal resistance for tomato and carnation and petunia. BARD, 1996-1999, $300,000 ($150,000 to Hort) (Watad AA, Hasegawa PM, Bressan RA)

Salt tolerance of plants expressing calcineurin. USDA/NRICGP, 1997-1999, $110,000 (Hasegawa PM, Bressan RA, Pardo JM)

Improving commercial mint varieties through biotechnology. Mint Council - 1997-2000 - $366,000 (Weller SC, Bressan RA, Hasegawa PM)

Molecular evolution of cysteine proteinase inhibitors. PRF Grant, 1998-2000, $22,000

Tomato Genomics – NRICGP/ARP, Purdue University, 9-1998 - $162,000 (Bressan RA, Hasegawa PM)

Genes controlling cytotoxicity of osmotin, a plant defense protein. NSF MCB98-8551, 1998-2001, $300, 000 (Bressan RA, Narasimhan ML)

Genomics of plant stress tolerance, NSF DBI-9813360, 1998-2003, $2,250,000 to Purdue University (Bressan RA, Hasegawa PM)

Improved Surimi processing through bioengineering of proteinase inhibitors, USDA/NRICGP, 1998-2000, $73,830 to Purdue University (Hasegawa PM, Bressan RA)

Isolation of wheat seed proteins with substantial antifungal activities against *Aspergillus flavus*. USDA, 1998, $25,000 (Bressan RA, Hasegawa PM)

Enhanced SCN resistance through metabolic engineering of cysteine proteinase inhibitors – Indiana Soybean Board #98-210, 1998-2000, $173,000 (Hasegawa PM, Bressan RA)

Memorandum of Agreement, Stress tolerance genes and their use in transgenic crop plants, Futuragene, 5/20/2003-2/28/2005, $25,000 (Bressan RA, Hasegawa PM)

Enhanced salt tolerance in tomato – SBIR, May 15, 2004-October 15, 2004, $25,000 (Hasegawa PM, Bressan RA)

Thellungiela halophila (Salt Cress), a halophyte and cryophyte Arabidopsis relative as a genetic model to identify stress adaptation determinants – NSF #0416773, 2004-2008, $500,000 (Hasegawa PM, Bressan RA)

Genes controlling *SOS1* mRNA stability in response to abiotic stresses – USDA #102074, 2004-2008, $400,000 (Hasegawa PM, Shi H)

Collaborative Research: Arabidopsis 2010: Functional Analysis of Calcium/Calmodulin-mediated Transcriptional Networks in *Arabidopsis* – NSF #0424850, 2004-2008, $296,062 (Hasegawa PM)

Unrestricted gift to the HLA Department in support of RA Bressan and PM Hasegawa research, Futuragene, 8-2004, $904,000

Mechanisms by which SUMO modified ICE1 facilitate *CBF* regulated low temperature signaling and freezing tolerance of plants – USDA-NRI #103314, Sept 1, 2008-August 31, 2011, $349,834

Calcium-regulated transcription factors mediating carbon metabolism and partitioning in response to drought. BARD, #204163, 2009, $340,000 (Purdue portion $163,200) (with Hillel Fromm, Israel)

10. Other Research and Scholarly Activities:

Steering Committee for Tissue Culture Working Group Workshop at the 1979 ASHS Annual Meeting

Organizer and co-convener of Session in Depth on Somatic Cell Selection and Crop Productivity, Annual Meeting Tissue Culture Association, 1980

Vice Chairman, Tissue Culture Working Group ASHS, 1980-1981

Chairman of Program Committee of the Plant Division of the Tissue Culture Association, 1981-1982

Chairman, Tissue Culture Working Group ASHS, 1981-1982

Executive Board and Executive Council Member, Tissue Culture Association, 1982

Chairman ASPP Election Committee, 1983

USDA/CRGO Panel on Biotechnology: Genetic and Molecular Responses to Physical Stress in Plants, 1986-1987

USDA Competitive Research Grant Panel - SBIR-Plant Production, 1988-1989

NSF-Cellular Biosciences Research Grant Panel, September 9, 1988

USAID-USDA-CSRS Research Constraints Grants - Review group for both preproposals and full proposals, 1988-1989

Editorial Board for the journal Plant Physiology, 1988-1991

USDA Competitive Research Grant Panel - SBIR - Plant Production - Topic Manager, 1989-1990

Organizer and Convener of a symposium on "Mechanisms of plant adaptation to salt", NATO Workshop on "Biochemical and physiological mechanisms associated with environmental stress tolerance in plants", Norwich, UK, August 2-7, 1987

Organizer and Convener of the session on "Salinity Stress", NATO Advanced Research Workshop, Mrogowa, Poland, June 12-19, 99

Editorial Committee for Annual Review of Plant Physiology and Plant Molecular Biology, Volume 50, 1999

Vice-chair Salinity and Water Stress Gordon Conference, Tilton, NH, 2000

Polar Research Board Participant, Frontiers in Polar Biology Workshop, National Academy of Sciences/NSF, Lake Tahoe, NV, September 9-11, 2002

NSF-Eukaryotic Genetics Grant Panel, October 30-November 3, 2002

NSF-Signal Transduction Grant Panel, October 29-31, 2003

NSF-Signal Transduction Grant Panel, November 8-10, 2004

GHARDEN Proposal Planning Meeting with USAID, Washington, DC, August 10, 2004

Tomato Genome Initiative, Madrid, Spain, December 2-4, 2004

Discussion Leader, Temperature Stress in Plants Gordon Research Conference, January 30-February 4, 2005

Research Coordination Meeting – Crop Tolerance to Salt and Drought for FAO/International Atomic Energy Agency, Vienna, Austrai, March 14-18, 2005

NSF Panel Member - (Proposal Review Panel for Functional and Regulatory Systems Cluster (Plant)), Washington, DC, November 7-9, 2005

Judge for 2006 Intel International Science and Engineering Fair, Indianapolis, IN, May 10, 2006

FFA Agricience Fair Judge, Indianapolis, IN, October 26, 2006

Reviewer for NSF, NRI, BARD, DOE, JASHS, Plant Physiol, Plant J, Plant Cell, Physiol Plant, Plant Mol Biol, J Plant Physiol, Plant and Cell Physiol, PNAS, J Biol Chem, J Exptl Bot, Plant Cell Environ, Aus J Plant Physiol, Can J Bot, Amer J Bot, Science, Nature Genet, Nature Biotech

Volunteer FFA Agriscience Fair Judge, Indianapolis, IN, October 25, 2007

NSF panel member – Process, Structure and Integrity Program in the IOS Division, March 24 to 26, 2008

MARD conference on Biotic and Abiotic Stress in Plants – Amman, Jordan, Program Co-Chair– November 1-13, 2008

11. Current Project Statements

AtGTL1 transcription factor regulates drought adaptation through Ca^{2+}/Calmodulin signaling.

Drought stress is a most critical limitation to plant growth and productivity. Plants have complex adaptation mechanisms that include Ca^{2+} signaling as a focal secondary messenger. Calmodulin (CaM) is presumed to be one of the primary Ca^{2+} signature-decoding molecules. Genome-wide screening of expression libraries using labeled recombinant CaM has revealed that AtGT-2 (GT elements-binding proteins) family are potential CaM binding transcription factors. AtGTL1, one of the AtGT-2 family, encodes a putative Ca^{2+}/CaM-binding transcriptional activator. *gtl1* T-DNA insertional mutations (*gtl1-1, gtl1-2* and *gtl1-3*) substantially enhance the capacity of plants to survive in response to severe water deficit stress because these plants maintain high leaf relative water content through reduced transpiration. *gtl1* plants exhibit reduced stomatal density in abaxial leaves and increased trichome density/size in adaxial leaves, which may reduce transpiration. *AtGTL1* expression is down-regulated by dehydration stress, which is consistent with the notion that the transcription factor is a negative regulator of drought adaptation response, which is important to maintain homeostasis for adaptation processes. Gene expression analysis by RT-PCR revealed that GTL1 regulates *DREB2A* expression in ABA-independent pathway, not ABA-dependent gene expression, suggesting that GTL1 mediates dehydration signal necessary for DREB2A expression. We hypothesize that Ca^{2+}/CaM-mediated GTL1 regulates drought stress adaptation through mechanism by which is linked to efficient water usage process. This research will provide functional understanding about how plants decode Ca^{2+}/CaM signals to initiate stress adaptation processes that could enhance crop yield stability under water deficit conditions.

Calcium-regulated transcription factors mediating carbon metabolism and partitioning in response to drought.

In view of the anticipated severe global shortage of water and desertification, much needs to be done to improve the efficiency of water acquisition by plants, and to improve plant tolerance to extreme water-deficient conditions. It is well accepted that future developments in these directions must be based on comprehensive understanding of the molecular and cellular processes that occur in the plant in stress situations. The proposed research seeks to reveal the changes in carbon metabolism and partitioning under drought stress, and to elucidate the metabolic and gene networks underlying these changes in the model plant *Arabidopsis thaliana*. The focus of the proposed research is a family of transcription factors (designated GTLs) that bind calcium/calmodulin, whose function is important for drought tolerance (preliminary unpublished results). Their known downstream target genes encode proteins functioning in the chloroplast and mitochondria and are involved in regulating carbon metabolism and energy balance. The proposed research includes the following approaches and methodologies: (1) Identifying all the downstream target genes of GTLs by chromatin immuno-precipitation and hybridization of immuno-enriched DNA fragments to genomic DNA chips (ChIP on chip). This approach will be complemented by *in vitro* DNA-protein binding assays [Israel] and investigation of cell-specific expression of GTLs under

control and stress conditions [USA]; (2) Studies of GTL transcription activity *in vivo* and effects of cellular signals and calmodulin on transcription [Israel]; (3) physiological, transcriptome and metabolome investigation of genetically engineered plants and mutants under dehydration and rehydration conditions [USA]; (4) bioinformatic studies of GTL DNA-target sites [Israel], and the topology of metabolic and expressed gene networks [USA]. The proposed research is expected to provide novel information on carbon metabolism and partitioning under stress, and the cellular factors that underlie these metabolic activities. These cellular processes and their physiological consequences must be taken into consideration in future strategies of crop improvement for harsh environments.

Mechanisms by which the SUMO E3 ligase SIZ1 activates ICE1 to facilitate CBF-regulated low temperature signaling and freezing tolerance of plants.
Our studies have determined that the SUMO (small ubiquitin-related modifier) E3 ligase AtSIZ1 facilitates cold-induced CBF3 expression and cold acclimation in Arabidopsis. SIZ1-dependent sumoylation of ICE1 (CBF activator) is necessary for CBF activation and freezing tolerance. The project objectives are to determine the mechanisms by which SIZ1 mediated, SUMO-conjugated ICE1 activates CBF expression and represses expression of MYB15 (CBF3 repressor), and establish that, like CBF, SIZ1 and ICE1 orthologs function in freezing tolerance of crops such as rice and tomato. Specifically, Objective 1 will determine if sumoylated ICE1 activates CBF3 and represses MYB15 expression through remodeling of CBF3 and/or MYB15 chromatin. Alternatively, sumoylation of ICE1 may affect DNA-binding activity or protein-protein interaction or subnuclear compartmentalization of the transcription factor, which will be assessed by ChIP analysis, proteomics, and fluorescence imaging. Objective 2 is to determine if sumoylation activates ICE1 or if other post-translational modification processes are linked to SUMO conjugation. Previously, we determined that K393 is the target residue for sumoylation of ICE and recent results implicate S403 as a possible phosphorylation or O-linked β-N-acetylglucosamine (O-GlcNAc) conjugation site, which will be resolved by co-immunopreciptation assays. Objective 3 is to provide molecular genetic evidence that the SIZ1-ICE1 mediated freezing tolerance process and the post-translational regulatory mechanisms (sumoylation and phosphorylation or O-GlcNAc conjugation) of ICE1 are conserved in rice and tomato. The proposed research is focused to provide novel discovery information about cold signaling and gene expression regulatory mechanisms that mediate freezing tolerance that are conserved in plants and applicable to crops.

Low temperature induces SIZ1-mediated sumoylation of ICE1 that controls *CBF3/DREB1A* expression and freezing tolerance.
Sumoylation is a reversible post-translational conjugation process that covalently links the small ubiquitin modifier (SUMO) peptide to substrate proteins. In animals and yeast, SUMO conjugation to transcription factors facilitates activation or repression of gene expression. However, in plants, few sumoylation transcription factor substrates have been identified and process function has not been established. Dysfunctional *siz1-2* and *siz1-3* alleles that caused freezing and chilling sensitivities were complemented genetically by expressing *SIZ1*, indicating that the SIZ1 SUMO E3 ligase is a controller of low temperature adaptation in plants. Cold-induced expression of *CBF/DREB1*,

particularly of *CBF3/DREB1A*, and of their regulon genes was repressed by the *siz1* mutation. *siz1* did not affect expression of *ICE1* encoding a MYC transcription factor that is a controller of *CBF3/DREB1A*. A K393R substitution in ICE1 (ICE1(K393R)) blocked SIZ1-mediated sumoylation *in vitro* and *in vivo* identifying the lysine residue as the principal site of SUMO conjugation. SIZ1-dependent sumoylation of ICE1 was induced by cold. Sumoylation of recombinant ICE1 reduced polyubiquitination of the protein *in vitro*. ICE1(K393R) expression in wild-type plants repressed cold-induced *CBF3/DREB1A* expression and increased freezing sensitivity. Furthermore, expression of ICE1(K393R) induced transcript accumulation of *MYB15*, which encodes a MYB transcription factor that is a negative regulator of *CBF/DREB1*. Apparently, low temperatures induce SIZ1-dependent sumoylation of ICE1 that subsequently activates and/or stabilizes the protein and facilitates expression of *CBF3/DREB1A* and repression of *MYB15*, leading to low temperature tolerance.

***SIZ1* regulates cell proliferation and elongation that is mediated by salycylic acid**. The posttranslational conjugation of small ubiquitin-like modifiers (SUMOs) to other proteins is involved in the regulation of many aspects of eukaryote development, homeostasis, and stress response. Here, we demonstrate that *Arabidopsis* SUMO E3 ligase *SIZ1* controls cell proliferation and expansion. The T-DNA insertion *siz1-2* and *siz1-3* mature plants exhibited dwarf-like phenotypes. In these mutants, cell volume and the total number cells decreased, which led to a plant growth defect. The expression of *nahG*, a bacterial salicylate hydroxylase, suppressed defects in cell division and elongation in *siz1*. These results indicate that *SIZ1* controls salicylic acid (SA)-dependent cell growth. The expression of *XTH8* and *XTH31*, which encode xyloglucan endotransglycosylase/hydrolase, was down-regulated in *siz1*, and the reduction of *XTH8* and *XTH31* expression was restored in *nahG siz1-2*. These results indicate that *SIZ1* regulates cell expansion and proliferation by controlling the SA level.

Sumoylation of ABI5 by the *Arabidopsis* SUMO E3 ligase SIZ1 negatively regulates abscisic acid signaling.
SUMO (small ubiquitin-related modifier) conjugation (sumoylation) to protein substrates is a reversible posttranslational modification that regulates signaling by modulating transcription factor activity. This paper presents evidence that the SUMO E3 ligase SIZ1 negatively regulates abscisic acid (ABA) signaling that is dependent on the bZIP transcription factor ABI5. Loss-of-function, T-DNA insertion *siz1-2* and *siz1-3* mutations caused ABA hypersensitivity for seed germination arrest and seedling primary root growth inhibition. Further, expression of genes that are ABA-responsive through ABI5-dependent signaling (e.g. *RD29A*, *Rd29B*, *AtEm6*, *RAB18* and *ADH1*) was hyper-induced by the hormone in *siz1* seedlings. *abi5-4* suppressed ABA hypersensitivity caused by *siz1* (*siz1-2 abi5-4*), revealing an epistatic genetic interaction between *SIZ1* and *ABI5*. A K391R substitution in ABI5 [ABI5(K391R)] blocked 3 SIZ1-mediated sumoylation of the transcription factor *in vitro* and in *Arabidopsis* protoplasts indicating that ABI5 is sumoylated through SIZ1 and that K391 is the principal site for SUMO conjugation. *ABI5(K391R)* expression in *abi5-4* plants caused greater ABA hypersensitivity (gene expression, seed germination arrest and primary root growth inhibition) than *ABI5* expression in *abi5-4*. Together, these results establish that SIZ1-dependent sumoylation of

ABI5 attenuates ABA signaling. The double mutant *siz1-2 afp-1* exhibited even greater ABA sensitivity than the single mutant *siz1*, suggesting that SIZ1 represses ABI5 signaling function independent of AFP1.

12. General Departmental Contributions:

Coordinator of departmental tissue culture facilities - 1977 to 1998
Numerous faculty search committees - 1978 to present
Primary Promotion Committee - 1985 to present
School of Agriculture Promotion Committee - 1992 to 1995
Graduate Committee Chair – 1997 to 2000
Department Head Search Committee – 2006-2007
College of Agriculture Promotion Committee – 2006
Graduate Committee – 2006-present
Department Head Search Committee – 2007
Vice-Goldsbrough Search Committee – 2007-2008
Specialty Crops Genetics & Breeding Search Committee – 2008-2009
Epigenetics Search Committee – 2011-prespent