

# Curricula Vitae



**Name:** Sang-Soo KWAK, **Date of Birth:** February 16, 1959

**Address: Office:** Team Leader, Plant Antioxidation Research Team,  
Environmental Biotechnology Research Center,  
Korea Research Institute of Bioscience and Biotechnology (KRIBB)  
Oun-dong 52, Yuseong-gu, Daejeon 305-806, KOREA  
Telephone: 042-860-4432 Fax: 042-860-4608, E-mail: [sskwak@kribb.re.kr](mailto:sskwak@kribb.re.kr)

**Home:** EXPO apartment 307-306, Junmin-dong, Yuseong-gu, Daejeon 305-761, KOREA

## **Education:**

- B.S. 1980, Kyungpook National University, Daegu, KOREA, Major: Agronomy
- M.S. 1984, Kyungpook National University, KOREA, Major: Crop Sciences
- Ph.D. 1988, The University of Tokyo, JAPAN, Major: Agricultural Chemistry  
Thesis title: Chemical and Biochemical Studies on Gibberellin Biosynthesis  
Enzymes in the Higher Plants (Supervisor: Prof. Nobutaka TAKAHASHI)

## **Research Experience:**

### **<Main Job>**

- 1988. 4-1990. 3 Postdoctoral Research Associate, RIKEN, JAPAN
- 1990. 4-1995. 3 Senior Research Scientist, Bioresources Research Group, KRIBB
- 1996. 2-2000. 4 Leader, Plant Biochemistry Research Unit, PCBL, KRIBB
- 2000.2-2002.6 Head, Plant Cell Biotechnology Laboratory (PCBL), KRIBB
- 2005.8-2005.12 Head, Laboratory of Environmental Biotechnology, KRIBB
- 2006.1-2008.12 Director, Environmental Biotechnology Research Center, KRIBB
- 2009.12-present Director, Korea-China Biotechnology Joint Research Center  
to Combat Desertification, MEST (Ministry of Education, Science and Technology,  
Korea)

**<Additional Job>**

1995. 7-1999. 6 Adjunct Senior Researcher, Dept. of Horticulture, Chung-Nam Province Agricultural Research and Extension Services. Rural Development Administration (RDA)
1996. 9-2001. 8 Adjunct Professor, Dept. of Biology, Chungnam National University
1998. 3-2002. 2 Adjunct Professor, Dept. of Biology, Kongju National University
2002. 6-2004.12 Research Director, Upland Crops Research Group, BioGreen21 Program, RDA
2002. 7-2004. 12 Executive Editor, Korean Journal of Plant Biotechnology
2005. 1-2007.4 Research Director, Molecular Breeding Research Group, BioGreen21 Program, RDA
2003. 7-2007.6 Adjunct Senior Researcher, Dept. of Biotechnology, Chung-Nam Province Agricultural Research and Extension Services, RDA
2004. 11-Present Adjunct Professor, Environmental Biotechnology National Core Research Center, Gyeongsang National University
2005. 1-2008.12 Vice-president, Korean Society of Plant Biotechnology
2005. 10-2008. 4 BT Focal Point Coordinator in Korea between Korea and New Zealand
2006. 1-Present Editorial board, Plant Biotechnology Reports
2007. 3-Present Adjunct Professor, University of Science and Technology (UST)
2008. 7-Present Adjunct Professor, Institute of Soil and Water Conservation, Chinese Academy of Sciences, China
2009. 2-Present Editorial board, Plant Physiology and Biochemistry (PPB)
- 2010.1-Present Adjunct Professor, Sweetpotato Research Institute, Chinese Academy of Agricultural Sciences, China
- 2010.3-Present Vice president, Korean Society for Sweetpotato Research

**Research Topics:**

1. Understanding of antioxidation mechanism in plant cells
2. Development of transgenic plants with enhanced tolerance to environmental stress
3. Development of industrial plants to combat desertification in northeast Asia.
4. Metabolic engineering in transgenic sweetpotato for bioethanol and functional components

**Achievements:**

1. Papers: international journals (100), domestic journals (87)
2. Patents: international patents (7), domestic patents (24)
3. Technology-transfer to company: 5 items (taxol, peroxidase, urushiol, promoter, transgenic cell line)

**Notes:**

1. Enrollment of Marquis Who'sWho in the World (the 20<sup>th</sup> edition, December 2002)

2. Organizing chairman of Plant Bioventure Festival (April, 2003)
3. Tenure position in KRIBB (September, 2003)
4. Organizing chairman of Korea-Japan Joint Symposium on Plant Biotechnology (October, 2005)

## **Publication list (Sang-Soo Kwak)**

### **[International Journals]**

1. Kwak SS, Kamiya Y, Sakurai A, Takahashi N (1988) Isolation of gibberellin biosynthesis inhibitors from testas of *Phaseolus vulgaris* L. *Agric. Biol. Chemi.* 52:149-151.
2. Kwak SS, Kamiya Y, Takahashi M, Sakurai A, Takahashi N (1988) Metabolism of [<sup>14</sup>C]GA<sub>20</sub> in a cell-free system from developing seeds of *Phaseolus vulgaris* L. *Plant and Cell Physiology* 29:707-711.
3. Kwak SS, Kamiya Y, Sakurai A, Takahashi N, Graebe JE (1988) Partial purification and characterization of gibberellin 3 $\beta$ -hydroxylase from immature seeds of *Phaseolus vulgaris* L. *Plant and Cell Physiology* 29:935-943.
4. Sato F, Yamada Y, Kwak SS, Ichinose K, Kishida M, Takahashi N, Yoshida S (1991) Photoautotrophic cultured plant cells: A novel system to survey new photosynthetic electron transport inhibitors. *Z. Naturforsch.* 46c:563-568.
5. Saito T, Kwak SS, Kamiya Y, Yamane H, Sakurai A, Murofushi N, Takahashi N (1991) Effects of deoxygibberellin C (DGC) and 16-deoxy-DGC on GA 3 $\beta$ -hydroxylase and plant growth. *Plant and Cell Physiology* 32:239-245.
6. Kobayashi M, Kwak SS, Kamiya Y, Yamane H, Takahashi N, Sakurai A (1991) Conversion of GA<sub>5</sub> to GA<sub>6</sub> and GA<sub>3</sub> in cell-free system from *Phaseolus vulgaris* and *Oryza sativa*. *Agric. Biol. Chemi.* 55:249-251.
7. Lee H., Hong WH., Yoon JH, Song KM, Kwak SS, Liu JR (1992) Extraction of indole alkaloids from *Catharanthus roseus* by using supercritical carbon dioxide. *Biotechnology Techniques* 6:127-130.
8. Jung KH, Kwak SS, Kim SW, Choi CY, Heo GS, Liu JR (1992) Selection of protoclones for high yields of indole alkaloids from suspension cultures of *Catharanthus roseus* and the qualitative analysis of the compounds by LC-MS. *Biotechnology Techniques* 6:305-308.
9. Song KM, Park SW, Hong WH, Lee H, Kwak SS, Liu JR (1992) Isolation of vindoline from *Catharanthus roseus* by supercritical fluid extraction. *Biotechnology Process* 8:583-586.
10. Jung KH, Kwak SS, Kim SW, Lee H, Choi CY, Liu JR (1992) Improvement of the catharanthine productivity in hairy root cultures of *Catharanthus roseus* by using monosaccharides as a carbon source. *Biotechnology Letters* 14:695-700.

11. Jung KH, Kwak SS, Choi CY, Liu JR (1994) Development of two stage culture process by optimization of inorganic salts for improving catharanthine production in hairy root cultures of *Catharanthus roseus*. *Journal of Fermentation and Bioengineering* 77:57-61.
12. Kim SW, Song NH, Jung KH, Kwak SS, Liu JR (1994) High frequency plant regeneration from anther-derived cell suspension cultures via somatic embryogenesis in *Catharanthus roseus*. *Plant Cell Reports* 13:319-322.
13. Kim SW, Jung KH, Kwak SS, Liu JR (1994) Relationship between morphology and indole alkaloid production in suspension cultures of vinca (*Catharanthus roseus*). *Plant Cell Reports*. 14:23-26.
14. Choi MS, Kwak SS, Liu JR, Park YG, Lee MK, Ahn YH (1995) Taxol and related compounds in Korean native yews (*Taxus cuspidata*). *Planta Medica* 61:264-266.
15. Kwak SS, Kim SK, Lee MS, Jung KH, Park IH, Liu JR (1995) Three acidic peroxidases from suspension-cultures of sweet potato. *Phytochemistry*.39:981-984.
16. Kwak SS, Choi MS, Lee MK, Park YG, Liu JR (1995) Taxol contents in the seeds of *Taxus* spp. *Phytochemistry*. 40:29-32.
17. Jung KH, Kwak SS, Choi CY, Liu JR (1995) An interchangeable system of hairy root and cell suspension culture in *Catharanthus roseus* for indole alkaloid production. *Plant Cell Reports*. 15:51-54.
18. Kwak SS, Kim SK, Park IH, Liu JR (1996) Enhancement of peroxidase activity by stress-related chemicals in suspension cultures of sweet potato. *Phytochemistry*. 43:565-568
19. Huh GH, Lee SJ, Bae YS, Liu JR, Kwak SS (1997) Molecular cloning and characterization of anionic and neutral peroxidase cDNAs from sweet potato suspension-cultured cells and their differential expression in response to stress. *Molecular General and Genetics*. 255: 382-391.
20. Huh GH, Yun BY, Lee HS, Jo JK, Kwak SS (1998) Overproduction of sweet potato peroxidases in transgenic tobacco plants. *Phytochemistry*. 47: 695-700.
21. Jung KH, Kwak SS, and Liu JR (1998) Process for biomass estimation considering the changes in biomass volume during high density culture of hairy roots. *J Biotechnol. Bioeng.* 85: 454-457.
23. Yun BY, Huh GH, Kwon SY, Lee HS, Jo JK and Kwak SS (1998) Antioxidant enzymes in *Nicotiana* cells containing an *Ipomoea* peroxidase gene. *Phytochemistry*. 48: 1287-1290.
24. Kwak SS and Yun BY (1998) Molecular breeding of environmental stress tolerant plant with using peroxidases of sweet potato. *Chemical Regulation of Plants*. 32(2): 127-130.
25. Kim KY, Huh GH, Lee HS, Kwon SY, Hur Y, Kwak SS (1999) Molecular characterization of two anionic peroxidase cDNAs isolated from suspension cultures of sweet potato. *Molecular General and Genetics* 261: 941-947.
26. Ahn YO, Kwon SY, Lee HS, Park IH, Kwak SS (1999) Biosynthesis and metabolism of vitamin C in suspension cultures of *Scutellaria baicalensis*. *Journal of Biochemistry and Molecular Biology* 32: 451-455.

27. Lee HS, Kim KY, You SH, Kwon SY, Kwak SS (1999) Molecular characterization and expression of a cDNA encoding copper/zinc superoxide dismutase from cultured cells of cassava (*Manihot esculenta* Crantz). *Molecular General and Genetics* 262: 807-814.
28. Yun BW, Huh GH, Lee HS, Kwon SY, Jo JK, Kim JS, Cho KY, Kwak SS (2000) Differential resistance to methyl viologen in transgenic tobacco plants that express sweet potato peroxidases. *Journal of Plant Physiology* 156: 504-509.
29. Kim KY, Kwon HK, Kwon SY, Lee HS, Hur Y, Kwak SS (2000) Differential expressions of four sweet potato peroxidase genes in response to abscisic acid and ethephon. *Phytochemistry* 54: 19-22.
30. Kwon SY, An CS, Liu JR, Kwak SS, Lee HS, Kim JK, Paek KH (2000) Molecular cloning of a cDNA encoding ribosome inactivating protein from *Amaranthus viridis* and its expression in *E. coli*. *Molecular and Cells* 10: 8-12.
31. Kim JW, Han SK, Kwon SY, Lee HS, Lim YP, Liu JR, Kwak SS (2000) High frequency shoot induction and plant regeneration from cotyledonary hypocotyl explants of cucumber (*Cucumis sativus* L.) seedlings. *Journal of Plant Physiology* 157: 136-139.
32. Kwon SY, Ahn YO, Lee HS, Kwak SS (2001) Biochemical characterization of transgenic tobacco plants expressing a human dehydroascorbate reductase gene. *Journal of Biochemistry and Molecular Biology* 34: 316-321.
33. Kim TH, Jung JK, Kwak SS, Nam SW, Chun MJ, Park YH (2002) Heterologous expression and secretion of sweet potato peroxidase isoenzyme A1 in recombinant *Saccharomyces cerevisiae*. *Biotechnology Letters* 24: 279-286
34. Kwon SY, Jeong YJ, Lee HS, Kim JS, Cho KY, Allen RD, Kwak SS (2002) Enhanced tolerance of transgenic tobacco plants expressing both superoxide dismutase and ascorbate peroxidase in chloroplasts against methyl viologen-mediated oxidative stress. *Plant, Cell, and Environment* 25: 873-882
35. Lee JY, Lee BY, Shin DJ, Kwak SS, Bahk JD, Lim CO, Yun DJ (2002) Carnitine uptake by AGP2 in yeast *Saccharomyces cerevisiae* is dependent on HOG kinase pathway. *Molecules and Cells* 13: 407-412.
36. Moon HJ, Lee BY, Choi GT, Shin DJ, Theertha Prasad D, Lee OS, Kwak SS, Kim DH, Nam JS, Bahk JD, Hong JC, Lee SY, Cho MJ, Lim CO, Yun DJ (2003) Nucleoside diphosphate kinase 2 interacts with two oxidative stress-activated mitogen-activated protein kinases to regulate cellular redox state and enhances multiple stress tolerance in transgenic plants. *Proceedings of the National Academy of Sciences of the United States* 100: 358-363
37. Lee OS, Lee BY, Park NM, Koo JC, Kim YH, Theertha Prasad D, Chandrakant Karigar, Chun HJ, Jeong BR, Kim DH, Nam JS, Yun JG, Kwak SS, Cho MJ, Yun DJ (2003) Pn-AMPs, the hevein-like proteins from *Pharbitis nil* confers disease resistance against phytopathogenic fungi in tomato, *Lycopersicon esculentum*. *Phytochemistry* 62:1073-1079

38. Choi SM, Lee OS, Kwon SY, Kwak SS, Yu DY, Lee HS (2003) High expression of a human lactoferrin tobacco cell cultures. *Biotechnology Letters* 25: 213-218
39. Kwon SY, Choi SM, Ahn YO, Lee HS, Lee HB, Park YB, Kwak SS (2003) Enhanced stress-tolerance of transgenic tobacco plants expressing a human dehydroascorbate reductase gene. *Journal of Plant Physiology* 160: 347-353
40. Kim KY, Kwon SY, Lee HS, Hur YK, Bang JW, Kwak SS (2003) A novel oxidative stress-inducible peroxidase promoter from sweet potato: molecular cloning and characterization in transgenic tobacco plants and cultured cells. *Plant Molecular Biology* 51: 831-838
41. Lee HS, Kwon EJ, Jeong YJ, Kwon SY, Lee EM, Jo MH, Kim HS, Woo IS, Kwak SS (2003) Transgenic cucumber fruits that produce high levels of an anti-aging superoxide dismutase. *Molecular Breeding* 11: 213-220
42. Park SY, Ryu SH, Kwon SY, Lee HS, Kim JG, Kwak SS (2003) Differential expression of six novel peroxidase cDNAs derived from sweetpotato cell cultures in response to stress. *Molecular Genetics and Genomics* 269: 542-552
43. Choi SM, Lee OS, Kwon SY, Kwak SS, Lee HS (2003) Transgenic ginseng cell lines that produce high levels of a human lactoferrin. *Planta Medica* 69:1005-1008
44. Kim JS, Yun BW, Choi JS, Kim TJ, Kwak SS, Cho KY (2004) Death mechanism caused by carotenoid biosynthesis inhibitors in green and in undeveloped plant tissues. *Pesticide Biochemistry and Physiology* 78: 127-139
45. Park SY, Ryu SH, Jang IC, Kwon SY, Kim JG, Kwak SS (2004) Molecular cloning of a cytosolic ascorbate peroxidase from cell cultures of sweetpotato and its expression in response to stress. *Molecular Genetics and Genomics* 271: 339-346
46. Jang IC, Park SY, Kwon SY, Kim JG, Kwak SS (2004) Differential expression of ten sweetpotato peroxidase genes in response to bacterial pathogen, *Pectobacterium chrysanthemi*. *Plant Physiology and Biochemistry* 42: 451-455
47. Lian HL, Yu X, Ye Q, Kwak SS, Su WA, Tang ZC (2004) The role of aquaporin RWC3 in drought avoidance of rice. *Plant and Cell Physiology* 45: 481-489
48. Pyon JY, Piao RZ, Roh SW, Shin SY, Kwak SS (2004) Differential levels of antioxidants in paraquat-resistant and -susceptible *Erigeron canadensis* biotypes in Korea. *Weed Biology and Management* 4: 75-80
49. Shin DJ, Koo YD, lee JY, Lee HJ, Baek DW, Lee SC, Cheon CI, Kwak SS, Lee SY, Yun DJ (2004) Athb-12, a homeobox-leucine zipper domain protein from *Arabidopsis thaliana*, increases salt tolerance in yeast by regulating sodium exclusion. *Biochemical and Biophysical Research Communications* 323: 534-540
50. Kim YH, Kim YH, Kwak SS, Kwon SY, Bae JM, Lee BR, Meen BG, Huh GH (2004) Alterations in intracellular and extracellular activities of antioxidant enzymes during suspension culture of

- sweetpotato. *Phytochemistry* 65: 2471-2476
51. Baek D, Nam J, Koo YD, Kim DH, Lee J, Jeong JC, Kwak SS, Chung WS, Lim CO, Lee SY, Kawai M, Uchimiya H, Yun DJ (2004) Bax-induced cell death of Arabidopsis is mediated through reactive oxygen-dependent and -independent processes. *Plant Molecular Biology* 56: 15-27
  52. Shin SY, Lee HS, Kwon SY, Kwon ST, Kwak SS (2005) Molecular characterization of a cDNA encoding copper/zinc superoxide dismutase from cultured cells of *Manihot esculenta*. *Plant Physiology and Biochemistry* 43: 55-60
  53. Wang FZ, Wang QB, Kwon SY, Kwak SS, Su WA (2005) Enhanced drought tolerance of transgenic rice plants expressing a pea manganese superoxide dismutase. *Journal of Plant Physiology* 162: 465-472
  54. Kang CH, Jung WY, Kang YH, Kim DG, Jeong JC, Baek DW, Jin JB, Chung WS, Mengiste T, Koiwa H, Kwak SS, Bahnk JD, Lee SY, Nam JS, Yun DJ, Cho MJ (2006) AtBAG6, a novel calmodulin-binding protein, induces programmed cell death in yeast and plants. *Cell Death and Differentiation* 13: 84-95
  55. Jin H, Plaha P, Park JY, Hong CP, Lee IS, Yang ZH, Jiang GB, Kwak SS, Liu SK, Lee JS, Kim YA, Lim YP (2006) Comparative EST profiles of leaf and root *Leymus chinensis*, a xerophilous grass adapted to high pH sodic soils. *Plant Science* 170: 1081-1086
  56. Lee SH, Lee DG, Woo HS, Lee KW, Kim DH, Kwak SS, Kim JS, Kim H, Ahsan N, Choi MS, Yang JK, Lee BH (2006) Production of transgenic orchardgrass via *Agrobacterium*-mediated transformation of seed-derived callus tissues. *Plant Science* 171: 408-414.
  57. Lin Y, Deng XP, Kwak SS, Tanaka K (2006) Enhanced drought tolerance in transgenic sweetpotato expressing both Cu/Zn superoxide dismutase and ascorbate peroxidase. *Journal of Plant Physiology and Molecular Biology* 32: 451-457.
  58. Lee YK, Kim IJ, Kim GT, Park JM, Kwak SS, Choi G, Chung WI (2006) LONGIFOLIA1 and LONGIFOLIA2, two homologous proteins, regulate longitudinal cell elongation independent of ROTUNDIFOLIA3. *Development* 133: 4305-4314.
  59. Tang L, Kwon SY, Kim JS, Choi JS, Cho KY, Sung CK, Kwak SS, Lee HS (2006) Enhanced tolerance of transgenic potato plants expressing both superoxide dismutase and ascorbate peroxidase in chloroplasts against oxidative stress and high temperature. *Plant Cell Reports* 25: 1380-1386
  60. Jo SH, Kwon SY, Kim JW, Lee KT, Kwak SS, Lee HS (2006) High-yield production of functional human lactoferrin in transgenic cell cultures of Siberian ginseng (*Acanthopanax senticosus*). *Biotechnology and Bioprocess Engineering* 11: 442-448.
  61. Lee J, Nam J, Park HC, Na G, Miura K, Jin JB, Yoo CY, Baek DW, Jeong JC, Kwak SS, Lee SY, Salt DE, Mengiste T, Gong Q, Ma S, Bohnert HJ, Bressan RA, Hasegawa PM, and Yun DJ (2007) Salicylic acid-mediated innate immunity in *Arabidopsis* is regulated by SIZ1 SUMO E3 ligase. *Plant Journal* 49: 79-90.

62. Lim S, Kim YH, Kim SH, Kwon SY, Lee HS, Kim JG, Cho CY, Paek KY, Kwak SS (2007) Enhanced tolerance of transgenic sweetpotato plants expressing both superoxide dismutase and ascorbate peroxidase in chloroplasts against methyl viologen-mediated oxidative stress. *Molecular Breeding* 19: 227-239.
63. Lee YP, Kim SH, Bang JW, Lee HS, Kwak SS, Kwon SY (2007) Enhanced tolerance to oxidative stress in transgenic tobacco plants expressing three antioxidant enzymes in chloroplasts. *Plant Cell Reports* 26: 591-598.
64. Shin YM, Choe G, Shin BC, Yi GB, Yun PY, Yang KY, Lee JS, Kwak SS, Kim KM (2007) Selection of nptII transgenic sweetpotato plants using G418 and paromomycin. *Journal of Plant Biology* 50: 206-212.
65. Um MO, Park TI, Kim YJ, Seo HY, Kim JG, Kwon SY, Kwak SS, Yun DJ, Yun SJ (2007) Particle bombardment-mediated transformation of barley with an *Arabidopsis* NDPK2 cDNA. *Plant Biotechnology Reports* 1: 71-77
66. Liu HY, Yu Xin, Cui DY, Sun MH, Sun WN, Tang ZC, Kwak SS, Su WA(2007) The role of water channel proteins and nitric oxide signaling in rice seed germination. *Cell Research* 17: 638-649
67. Tang L, Tang H, Wang SY, Yang XI, Lee HS, Kwak SS (2007) *Agrobacterium*-mediated transformation of an ecologically important potato cultivar using internodal stem explants. *China Biotechnology* 27: 80-87
68. Lee SH, Ahsani N, Lee KW, Kim DH, Lee DG, Kwak SS, Kwon SY, Kim TH, Lee BH (2007) Simultaneous overexpression of both CuZn superoxide dismutase and ascorbate peroxidase in transgenic tall fescue plants confers increased tolerance to a wide range of abiotic stresses. *Journal of Plant Physiology* 164: 1626-1638
69. Kim YH, Lim S, Han SH, Lee JC, Song WK, Bang JW, Kwon SY, Lee HS, Kwak SS (2007) Differential expression of ten sweetpotato peroxidases in response to sulfur dioxide, ozone, and ultraviolet radiation. *Plant Physiology and Biochemistry* 45: 908-914
70. Kim YH, Kim CY, Song WK, Park DS, Kwon SY, Lee HS, Bang JW, Kwak SS (2008) Overexpression of sweetpotato swpa4 peroxidase results in increased hydrogen peroxide production and enhances stress tolerance in tobacco. *Planta* 227: 867-881
71. Kim YH, Ryu SH, Kim KY, Song WK, Kwon SY, Lee HS, Bang JW, Kwak SS (2008) Molecular characterization of a cDNA encoding DRE-binding transcription factor from dehydration-treated fibrous roots of sweetpotato. *Plant Physiology and Biochemistry* 46: 196-204
72. Kim YH, Ryu SH, Kim KY, Song WK, Kwon SY, Lee HS, Bang JW, Kwak SS (2008) Molecular cloning of three novel peroxidase cDNAs from dehydration-treated fibrous roots of sweetpotato and their differential expression in response to stress. *BMB Reports* 41: 259-265

73. Ahmad R., Kim MD, Back KH, Kim HS, Lee HS, Kwon SY, Murata N, Chung WI, Kwak SS (2008) Stress-induced expression of choline oxidase in potato plant chloroplasts confers enhanced tolerance to oxidative, salt, and drought stresses. *Plant Cell Reports* 27: 687-698
74. Uddin MD, Qi Y, Yamada S, Shibuya I, Deng XP, Kwak SS, Kaminaka H, Tanaka K (2008) Overexpression of a new rice vacuolar antiporter regulating protein OsARP improves salt tolerance in tobacco. *Plant Cell Physiology* 49: 880-890
75. Tang L, Kim MD, Yang KS, Kwon SY, Kim JS, Yun DJ, Kwak SS, Lee HS (2008) Enhanced tolerance of transgenic potato plants overexpressing nucleoside diphosphate kinase 2 against multiple environmental stresses. *Transgenic Research* 17: 705-715
76. Tang L, Tang H, Kwak SS, Lee HS, Wang SY, Yang XL (2008) Potato plants improving oxidative stress and salt tolerance by gene transfer both of Cu/Zn superoxide dismutase and ascorbate peroxidase. *China Biotechnology* 28: 25-31
77. Ahsan N, Lee DG, Alam I, Kim PJ, Lee JJ, Ahn YO, Kwak SS, Lee IJ, Bahk JD, Kang KY, Renault J, Komatsu S, Lee BH (2008) Comparative proteomic study of arsenic-induced differentially expressed proteins in rice roots reveals glutathione plays a central role during As stress. *Proteomics* 8: 3561-3576
78. Jin H, Plaha P, Park JY, Hong CP, Lee IS, Yong ZH, Jiang GB, Kwak SS, Liu SK, Lim YP (2008) Expression profiles of genes in root and shoot induced by NaCl and Na<sub>2</sub>CO<sub>3</sub> stresses using cDNA microarray in *Leymus chinensis*. *Plant Science* 175: 784-792
79. Ahmad R, Kim YH, Kim MD, Phung MN, Chung WI, Lee Hs, Kwak SS, Kwon SY (2008) Development of selection marker-free transgenic potato plants with enhanced tolerance to oxidative stress. *Journal of Plant Biology* 51: 401-407
80. Ryu SH, Kim YH, Kim CY, Park SY, Kim SH, Kwon SY, Lee HS, Bang JW, Kwak SS (2009) Molecular characterization of the sweetpotato peroxidase SWPA4 promoter which responds to abiotic stresses and pathogen infection. *Physiologia Plantarum* 135: 390-399
81. Kim SH, Song WK, Kim KY, Kim YH, Kwon SY, Lee HS, Lee IC, Kwak SS (2009) Characterization of full-length enriched expressed sequence tags of dehydration-treated white fibrous roots of sweetpotato. *BMB Reports* 42: 271-276
82. Wang WB, Kim YH, Lee HS, Kim KY, Deng XP, Kwak SS (2009) Analysis of antioxidant enzyme activity during germination of alfalfa under salt and drought stresses. *Plant Physiology and Biochemistry* 47: 570-577
83. Kim YH, Kim CY, Lee HS, Kwak SS (2009) Changes in activities of antioxidant enzymes and their gene expression during leaf development of sweetpotato. *Plant Growth Regulation* 58: 235-241
84. Kim YH, Lim S, Yang KS, Kim CY, Kwon SY, Lee HS, Wang X, Zhou Z, Ma D, Yun DJ, Kwak SS (2009) Expression of Arabidopsis NDPK2 increases antioxidant enzyme activities and enhanced tolerance to multiple environmental stresses in transgenic sweetpotato plants. *Molecular Breeding* 24: 233-244
85. Wang WB, Kim YH, Deng XP, Kwak SS, Wang ZH, Zhao ZP (2009) Physiological and biological

- responses of alfalfa shoots and roots to salt stress. *Journal of Northwest A&F University* 37:217-223
86. Wang WB, Kim YH, Lee HS, Deng XP, Kwak SS (2009) Differential antioxidation activities in two alfalfa cultivars under chilling stress. *Plant Biotechnology Reports* 3: 301-307
  87. Ahn YO, Kim SH, Kim CY, Lee JS, Kwak SS, Lee HS (2010) Exogenous sucrose utilization and starch biosynthesis among sweetpotato cultivars. *Carbohydrate Research* 345: 55-60
  88. Ahmad R, Kim YH, Kim MD, Kwon SY, Chung WI, Lee HS, Kwak SS (2010) Simultaneous expression of choline oxidase, superoxide dismutase, and ascorbate peroxidase in potato plant chloroplasts provides synergistically enhanced protection against various abiotic stresses. *Physiologia Plantarum* 138: 520-533
  89. Kim KH, Alam I, Lee KW, Sharmin SA, Kwak SS, Lee SY, Lee BH (2010) Enhanced tolerance of transgenic tall fescue plants overexpressing 2-Cys peroxiredoxin against methyl viologen and heat stresses. *Biotechnology Letters* 32: 571-576
  90. Lee YP, Baek KH, Lee HS, Kwak SS, Bang JW, Kwon SY (2010) Tobacco seeds simultaneously over-expressing Cu/Zn-superoxide dismutase and ascorbate peroxidase display enhanced seed longevity and germination rates under stress conditions. *Journal of Experimental Botany* 61: 2499-2506
  91. Kim CY, Ahn YO, Kim SH, Kim YH, Lee HS, Catanach AS, Jacobs JME, Conner AJ, Kwak SS (2010) The sweet potato *IbMYB1* gene as a potential visible marker for sweetpotato intragenic vector system. *Physiologia Plantarum* 139: 229-240.
  92. Kim YH, Lee HS, Kwak SS. Differential responses of sweetpotato peroxidases to heavy metals. *Chemosphere* 81: 79-85
  93. Kim MD, Kim YH, Kwon SY, Yun DJ, Kwak SS, Lee HS (2010) Enhanced tolerance to methyl viologen-induced oxidative stress and high temperature in transgenic potato plants overexpressing the CuZnSOD, APX and NDPK2 genes. *Physiologia Plantarum* 140: 153-162
  94. Wu XB, Cheng YJ, Deng XP, Kwak SS (2010) Effect of foliar spraying of H<sub>2</sub>O<sub>2</sub> and Cu/Zn SOD and APX gene transferred in chloroplasts on the recoverability of sweetpotato after chilling stress. *Scientia Agricultura Sinica* 43:1379-1388
  95. Lu YY, Deng XP, Kwak SS (2010) Overexpression of CuZn superoxide dismutase (CuZn SOD) and ascorbate peroxidase (APX) in transgenic sweetpotato enhances tolerance and recovery from drought stress. *African Journal of Biotechnology* 9: 8378-8391
  96. Park SC, Kim YH, Jeong JC, Kim CY, Lee HS, Bang JW, Kwak SS (2011) Sweetpotato late embryogenesis abundant 14 (*IbLEA14*) gene influences lignification and increases osmotic- and salt stress-tolerance of transgenic calli. *Planta* 234: 621-634
  97. Kim YH, Kim MD, Choi YI, Park SC, Yun DJ, Noh EW, Lee HS, Kwak SS (2011) Transgenic poplar expressing Arabidopsis NDPK2 enhances growth as well as oxidative stress tolerance. *Plant Biotechnology Journal* 9: 334-347
  98. Kim MD, Kim YH, Kwon SY, Lee SY, Kwak SS, Lee HS (2011) Overexpression of 2-Cys peroxiredoxin enhances tolerance to MV-mediated oxidative stress and high temperature in transgenic potato plants. *Plant Physiology and Biochemistry* 49: 891-897
  99. Ahn YO, Kim SH, Lee HS, Kwak SS (2011) Three *Brassica rapa* metallothionein genes are differentially regulated under various stress. (in press)
  100. Kim YH, Kim MD, Park SC, Yang GS, Lee HS, Kwak SS (2011) *SCOF-1*-expressing transgenic sweetpotato plants show enhanced tolerance to low-temperature stress. (in press)
  101. Kim SH, Ahn YO, Ahn MJ, Lee HS, Kwak SS. Down-regulation of *IbCHY* increases beta-carotene content and enhances salt stress tolerance in transgenic cultured cells of sweetpotato. (under revision)
  102. Kim YH, Jeong JC, Lee HS, Huh GH, Kwak SS. Different responses of two ethylene response factor

genes of sweetpotato under stress conditions and defense gene expression by their transient expression in tobacco leaves. (under revision).

103. Lim S, Kim YH, Han SH, Lee JC, Kwon SY, Lee HS, Kwak SS Transgenic sweetpotato plants overexpressing both superoxide dismutase and ascorbate peroxidase in chloroplasts show enhanced tolerance to SO<sub>2</sub>. (submitted).
104. Cheng YJ, Zhang SQ, Deng XP, Kwak SS. Water use efficiency and physiological metabolism of transgenic sweetpotato expressing both Cu/Zn SOD and APX genes in response to drought conditions during vegetative propagation. (submitted)
105. Chen W, Deng XP, Kwak SS, Enji AE. Expression of fructan exo-hydrolases in relation to yield of two drought resistant wheat cultivars under different fertilizer and tillage regions. (submitted)
106. Lee SH, Nagib A, Lee KW, Kim KH, Lee HS, Kwak SS, Yun DJ, Kim KY, Lee BH. Transgenic tall fescue plants overexpressing an Arabidopsis NDPK2 gene shows enhanced tolerance to salt stress. (in preparation).

### [Korean Journals]

(1984-1998: 38 papers on secondary metabolite)

1. Lee HS, You SH, Kwon SY, Kim JS, Kwak SS (1999) Gamma radiation-induced changes of antioxidant enzymes in callus cultures of cassava (*Manihot esculenta* Crantz). *Korean Journal of Plant Tissue Culture* 26: 53-58.
2. Lee HS, Kim YS, Kwon SY, Kwak SS, Liu JR (1999) Correlation between in vitro flowering frequency and the structure of cytokinins in ginseng (*Panax ginseng* C.A. Meyer). *Korean Journal of Plant Tissue Culture* 26: 109-113.
3. Han SS, Lo SC, Choi YH, Kim MJ, Kwak SS (1999) Antioxidative compounds in extracts of *Acer ginnala* Max. *Korean J of Medicinal Crop Science* 7: 51-57.
4. Kwon HK, Kwon SY, Lee HS, Yoon ES, Kim JS, Cho KY, Kwak SS (1999) Responses of tobacco photomixotrophic cultured cells to various herbicides. *Korean Journal of Plant Tissue Culture* 26: 183-187.
5. Yun BW, Lee HS, Kwon SY, Kim JS, Kwak SS (1999) Responses of transgenic tobacco plants expressing sweet potato peroxidases to gamma radiation. *Korean Journal of Plant Tissue Culture* 26(4): 265-269.
6. Hong DH, Han SB, Lee CW, Park SH, Jeon YJ, Kim MJ, Kwak SS, Kim HM (1999) Cytotoxicity of urushiols isolated from sap of Korean lacquer tree (*Rhus vernicifera* Stokes). *Archives of Pharmacal Research* 22: 638-641.
7. Lee JE, Ahn YO, Kwon SY, Lee HS, Kim SW, Park IH, Kwak SS (2000) Glutathione contents in various plant cell lines. *Korean Journal of Plant Tissue Culture* 27(1): 57-61.
8. Kwak SS, Kwon HK, Kwon SY, Lee HS, Lee HJ, Ko YH (2000) Effects of dykellic acid derived from microorganism on the cell growth and superoxide dismutase activity in tobacco photomixotrophic cultured cells. *Korean Journal of Plant Tissue Culture* 27(2): 133-136.
9. Lee EM, Jo MH, Dong NH, Woo IS, Lee YB, Kwak SS (2000) Light influences, morphogenesis and protein content on callus differentiation of cucumber (*Cucumis sativus* L.). *Korean Journal of Plant*

- Tissue Culture* 27(3): 213-217.
10. Lee SS, Ahn YO, Kwon SY, Lee HS, Kwak SS, Lee MG, Choi KT (2000) Studies on the casual components of rusty-root on *Panax ginseng*. I. Antioxidative activity oriented. *Journal of Ginseng Research* 24: 113-117.
  11. Choi SM, Kwon SY, Kwak SS, Park YM (2000) Responses of transgenic tobacco plants overexpressing superoxide dismutase and ascorbate peroxidase in chloroplasts to water stress. *Journal of Korean Environmental Science Society* 10: 79-84.
  12. Kwon SY, Lee HS, Kwak SS (2001) Development of environmental stress-tolerant plants by gene manipulation of antioxidant enzymes. *Plant Pathology Journal* 17: 88-93.
  13. Choi MS, Kwak SS, Liu JR, Lee IK, Yoo ID (2001) Production of novel flavonoids in cell cultures of *Cudrania tricuspidata*. *Korean Journal of Plant Tissue Culture* 28: 159-164.
  14. Park UJ, Lee HS, Kwon SY, Choi KS, Kwak SS (2002) Transgenic tomato plants that overexpress superoxide dismutase in fruits. *Korean Journal of Plant Biotechnology* 29: 7-13.
  15. Lee HS, Kim KY, Kwon SY, Kwak SS (2002) Development of industrial transgenic plants using antioxidant enzyme genes. *Korean Journal of Plant Biotechnology* 29: 69-77.
  16. Kwon EJ, kwon SY, Kim MZ, Lee JS, Ahn YS, Jeong BC, Kwak SS, Lee HS (2002) Plant regeneration of major cultivars of sweetpotato (*Ipomoea batatas*) in Korea. *Korean Journal of Plant Biotechnology* 29: 189-192.
  17. Lee OS, Choi SM, Kwon SY, Lee HS, Kim KY, Kim JW, Kwak SS (2002) A novel oxidative stress-inducible peroxidase promoter and its applications to production of pharmaceutical proteins in transgenic cell cultures. *Journal of Plant Biotechnology* 4: 155-162
  18. Park SY, Kwon SY, Ryu SH, Kim JG, Kwak SS (2003) Molecular cloning and characterization of a peroxiredoxin cDNA from cell cultures of sweetpotato. *Korean Journal of Plant Biotechnology* 30: 135-141
  19. Kwak SS, Kwon SY (2003) Current status and prospects of environmental plant biotechnology using genomic informatics. *The Microorganisms and Industry* 29: 2-7
  20. Kim KY, Kang KM, Park GJ, Bae EK, Lee IA, Lee BH, Kwak SS, Jo JK (2003) Examination of root induction ratio for regeneration of alfalfa by medium component. *Journal of the Korean Society of Grassland Science* 23: 95-100
  21. Kim YH, Kwon SY, Bang JW, Kwak SS (2003) Photosynthetic efficiency in transgenic tobacco plants expressing both CuZnSOD and APX in chloroplasts against oxidative stress caused by highlight and chilling. *Korean Journal of Plant Biotechnology* 30: 399-403
  22. Tang L, Kwon SY, Kwak SS, Sung CK, Lee HS (2003) Susceptibility of two potato cultivars to various environmental stresses. *Korean Journal of Plant Biotechnology* 30: 405-410
  23. Kim YH, Ryu SH, Kim KY, Kwon SY, Bang JW, Kwak SS (2004) Induction of a sweetpotato anion peroxidase swpa2 gene expression by stress-related chemicals and *Pectobacterium chrysanthemi*.

- Korean Journal of Plant Biotechnology* 31: 83-88
24. Tang L, Kwon SY, Kwak SS, Sung CK, Lee HS (2004) Selection of transgenic potato plants expressing both CuZnSOD and APX in chloroplasts with enhanced tolerance to oxidative stress. *Korean Journal of Plant Biotechnology* 31: 109-113
  25. Kim KY, Kwon SY, Song JY, Lee HS, Kwak SS (2004) Expression of a human histone H1.5 in transgenic tobacco cultured cells. *Korean Journal of Plant Biotechnology* 31: 175-178
  26. Tang L, Kwon SY, Yun DJ, Kwak SS, Lee HS (2004) Selection of transgenic potato plants expressing NDP kinase 2 gene with enhanced tolerance to oxidative stress. *Korean Journal of Plant Biotechnology* 31: 191-195
  27. Jo MH, Ham IK, Lee BC, Kim JW, Lee WS, Kwon SY, Lee HS, Kwak SS (2004) High frequency shoot formation and plant regeneration from cotyledonary hypocotyls explants of boxthorn (*Lycium chinense* Mill.) seedlings. *Korean Journal of Plant Biotechnology* 31: 203-207
  28. Lim S, Yang KS, Kwon SY, Paek KY, Kwak SS, Lee HS (2004) *Agrobacterium*-mediated genetic transformation and plant regeneration of sweetpotato (*Ipomoea batatas*). *Korean Journal of Plant Biotechnology* 31: 267-271
  29. Kim MD, Jin H, Park EJ, Kwon SY, Lee HS, Kwak SS (2005) Plant regeneration through somatic embryogenesis of *Leymus chinensis* Trin. *Korean Journal of Plant Biotechnology* 32: 51-55
  30. Kwon SY, Lee YP, Lim S, Lee HS, Kwak SS (2005) Transgenic plants with enhanced tolerance to environmental stress by metabolic engineering of antioxidative mechanism in chloroplasts. *Korean Journal of Plant Biotechnology* 32: 151-159
  31. Jo SH, Kwon SY, Kim JW, Lee KT, Kwak SS, Lee HS (2005) Transgenic Siberian ginseng cultured cells that produce high levels of human lactoferrin. *Korean Journal of Plant Biotechnology* 32: 209-215
  32. Kwon SY, Lee YP, Lim S, Lee HS, Kwak SS (2005) Transgenic plants with enhanced tolerance to environmental stress by metabolic engineering of antioxidative mechanism in chloroplasts. *Korean Journal of Plant Biotechnology* 32: 151-159
  33. Yang GS, Lim S, Kwon SY, Kwak SS, Kim HS, Lee HS (2005) Transgenic sweetpotato (*Ipomoea batatas*) expressing spike gene of porcine epidemic diarrhea virus. *Korean Journal of Plant Biotechnology* 32: 263-268
  34. Kim KY, Jang YS, Kim MJ, Lim KB, Kim WH, Seo S, Lee SJ, Kwak SS (2005) Production of transgenic birdsfoot trefoil plants by introduction of 'SWPA2 promoter + AtNDPK2 gene'. *J Korean Grassl Sci* 25: 281-286
  35. Kim JY, Beak DW, Lee HJ, Shin D, Lee J, Choi W, Kim D, Chung WS, Kwak SS, Yun DJ (2006) Isolation of SYP61/OSM1 that is required for salt tolerance in *Arabidopsis* by T-DNA Tagging. *Korean J. Plant Biotechnol.* 33:1-8

36. Kim KY, Jang YS, Choi GJ, Seong BR, Kim WH, Seo S, Lee BH, Kwak SS (2006) Production of transgenic Birdsfoot trefoil plants by Introduction of *E35S* Promoter + *AtNDPK2* gene. *Journal of Korean Grassl. Sci.* 26: 83-90
37. Lee HJ, Baek DW, Lee OS, Lee J, Kim D, Chung WS, Yun JG, Lee SW, Kwak SS, Kim DH, Yun DJ (2006) S<sub>CaM</sub>-5, a soybean calmodulin, is required for disease resistance against both a bacterial and fungal pathogen in tomato, *Lycopersicon esculentum*. *Journal of Plant Biotechnology* 33: 93-97
38. Song SW, Kwak SS, Lim S, Kwon SY, Lee HS, Park YM (2006) Enhanced resistance of transgenic sweetpotato (*Ipomoea batatas* Lam.) plants to multiple environmental stresses treated with combination of water stress, high light and high temperature stresses. *J Ecol Field Biol* 29: 479-484
39. Lee SH, Lee KW, Kim KY, Choi GJ, Seo S, Kwak SS, Kwon SY, Dae-Jun Yun, Lee BH (2007) Characterization of transgenic tall fescue plants expressing two antioxidant genes in response to environmental stresses. *Journal of Korean Grassl. Sci.* 22: 109-116
40. Tang L, Kwon SY, Kim MD, Kim JS, Kwak SS, Lee HS (2007) Enhanced tolerance to oxidative stress of transgenic potato (cv. Superior) plants expressing both SOD and APX in chloroplasts. *Journal of Plant Biotechnology* 34: 299-305
41. Yang KS, Kim HS, Kwon SY, Kwak SS, Lee HS (2008) Transgenic tobacco culture cells expressing spike protein gene of porcine epidemic diarrhea virus. *Journal of Plant Biotechnology* 35: 87-94
42. Kim SH, Song WY, Ahn YO, Lee HS, Kwak SS, Choi KS (2009) Enhancement of cadmium resistance by overexpression of BrMT3 in *Arabidopsis*. *Journal of Plant Biotechnology* 36: 68-74
43. Kim MD, Yang KS, Kwon SY, Lee SY, Kwak SS, Lee HS (2009) Selection of transgenic sweetpotato plants expressing 2-Cys peroxiredoxin with enhanced tolerance to oxidative stress. *J Plant Biotechnol* 36: 75-80
44. Lee SY, Han BH, Noh EW, Kwak SS (2009) Transfer of SOD2 or NDP kinase 2 genes into purebred lines of petunia. *J Plant Biotechnol* 36: 126-130
45. Kim MD, Ahn YO, Kim YH, Kim CY, Lee JJ, Jeong JC, Lee HS, Mok IG, Kwak SS (2009) Strategies of development of environmentally friendly industrial sweetpotato on marginal lands by molecular breeding. *J Plant Biotechnol* 36: 197-201
46. Mok IG, Zhao DL, Kwak SS (2009) Genetic resources of sweetpotato for industrial use. *J Plant Biotechnol* 36: 202-206
47. Ahn YO, Yang KS, Kim SH, Kwak SS, Lee HS (2009) Current status on molecular engineering of starch in sweetpotato. *J Plant Biotechnol* 36: 207-213
48. Ahn YO, Kim SH, Lee HS, Lee JS, Ma DF, Kwak SS (2009) Contents of low molecular weight antioxidants in the leaves of different sweetpotato cultivars at harvest. *J Plant Biotechnol* 36: 214-218
49. Kim YH, Park SC, Yang KS, Zhou ZL, Zhao DL, Ma DF, Jeong JC, Lee HS, Kwak SS (2009) Selection of oxidative stress-tolerant sweetpotato cultivars for cultivation on marginal lands. *J Plant Biotechnol* 36: 219-223

### **[International Patents]**

1. Method for the producing transgenic cucumber that produces high levels of superoxide dismutase.  
Kwak SS et al., US006084152 (00.7.4), Japan 3307604 (02.5.17), EU (99302909.9, pending).
2. A peroxidase genomic gene derived from *Ipomoea batatas* and a promoter thereof.  
Kwak SS et al. PCT/KR00/01231, US6,649,748 (03.11.18), JA3571639 (04.7.2), EU (07.7.4), China

(07.12.12), Canada (09.4.21)

3. Method for producing human lactoferrin in plant cell culture.

Lee HS, Kwak SS et al. Japan 2003-95307 (March 31, 2003), US

4. Multiple stress-inducible peroxidase promoter derived from *Ipomoea batatas*.

Kwak et al. PCT/KR2004/000381 (Feb. 24, 2004), US7,388,127B2 (06.6.17), China (09)

5. Recombinant expression vector for production of plants having multiple stress tolerances, and method for preparing multiple stress-tolerant plants using the same.

Kwak et al. PCT/KR2005/000258 (Jan. 28, 2005)

6. IbTIP1 gene derived from a root of *Ipomoea batatas* and a promoter thereof.

Kwak et al. China 200710160892.1 (Dec. 27, 2007)

7. IbOrange gene involved in carotenoid accumulation from *Ipomoea batatas*.

Kwak et al. PCT/KR2008/006813 (June 20, 2008)

8. IbLEA14 gene from a root of *Ipomoea batatas* and uses thereof.

Kwak et al. (Feb. 14, 2011)