CURRICULUM VITAE

LEON VINCENT KOCHIAN

Personal Data:

University Address: Robert W. Holley Center for Agriculture and Health
USDA-ARS
Tower Road, Cornell University
Ithaca, NY 14853

Research Interests:

Using genomic, genetic and physiological approaches to improve the abiotic stress tolerance for staple food crops, especially for agriculture in developing countries. Molecular physiology and biophysics of mineral nutrient transport processes in plants; mechanisms and regulation of plant micronutrient transport; rhizosphere biology; role of root biology in plant responses to environmental stresses; cellular and molecular basis of aluminum toxicity and resistance in plants; mechanisms of heavy metal transport and resistance in plants; use of plants to remediate heavy metal-polluted soils.

Education:

1978: B.A. Botany, Highest Honors, University of California, Berkeley

Honors Research Thesis: "Hydrogen Evolution Catalyzed by Nitrogenase and Hydrogenases in Cultures of Cyanobacteria" Thesis Advisor: Dr. Russell Jones

1983: Ph.D. Plant Physiology, University of California, Davis.

Dissertation Title: "The Kinetics, Mechanisms and Localization of K^+ Influx in *Zea mays* Roots" Major Professor: Dr. William J. Lucas

Professional Positions Held:

1978-82:	NSF Doctoral Fellow, Botany Department, University of California, Davis
1982-83:	UC Davis Graduate Fellow, Botany Department
1984-85:	Postdoctoral Research Associate, Botany Department, University of California, Davis
1985:	Lecturer, Botany Department, University of California, Davis
1985-Present:	Plant Physiologist, USDA-ARS, U.S. Plant, Soil and Nutrition Laboratory, Ithaca, NY
1986-1990:	Assistant Professor (Adjunct), Section of Plant Biology, Cornell University
1987-1990:	Assistant Professor (Adjunct), Agronomy Department, Cornell University
1990-1998:	Associate Professor (Adjunct), Department of Soil, Crop and Atmospheric

	Sciences, Cornell University
1990-1998:	Associate Professor (Adjunct), Section of Plant Biology, Cornell University
1995-1998:	Associate Professor (Adjunct), Graduate Field of Environmental Toxicology, Cornell University
1997-2008:	Research Leader, USDA-ARS, U.S. Plant, Soil and Nutrition Laboratory, Cornell University, Ithaca, NY
1998-Present:	Professor (Adjunct), Department of Plant Biology, Cornell University
1998-Present:	Professor (Adjunct), Department of Crop and Soil Sciences, Cornell University
1998-Present:	Professor (Adjunct), Graduate Field of Environmental Toxicology, Cornell University
2008-Present:	Center Director, Robert W. Holley Center for Agriculture and Health, USDA-ARS, Cornell University

Teaching Experience:

1979-82:	Teaching Assistant for Botany 206A (Advanced Plant Physiology Laboratory; Prof. William J. Lucas)
1985	Lecturer (full-time) - Botany 205A, UC Davis
1987-Present	Instructor (full-time), Plant Mineral Nutrition (offered as BioPL642 and CSS 642). Developed and teach this graduate course on plant mineral nutrition on a regular basis.

Honors and Awards:

- Graduation with Highest Honors, BA in Botany, Univ of California, Berkeley, 1978.
- Outstanding Undergraduate in Botany; University of California, Berkeley, 1978.
- Phi Beta Kappa, University of California, Berkeley; 1978.
- National Science Foundation Predoctoral Fellowship; University of California, Davis; 1978 – 1982.
- Distinguished Scholar Research Award; University of California, Davis; 1978
- Earle C. Anthony Graduate Fellowship; University of California, Davis; 1982, 1983.
- Best Paper, American Society of Plant Physiologists, Western Section Meetings, Eugene, Oregon, 1981.
- ARS Administrator's Award, 1988, 1992, 1995, 1997
- USDA-ARS Early Career Scientist of the Year, 1990
- Secretary of Agriculture's National Award - Environmental Protection, 1999
- ARS National Scientist of the Year, 1999
- Promotion to ARS Supergrade, 2006
- Fellow of the American Society of Plant Biologists, 2007
- Fellow, American Association for the Advancement of Science (AAAS), 2008

Membership in Professional Societies:

- American Society of Plant Biologists
- American Association for the Advancement of Science
- Sigma Xi
- Society for Experimental Biology (U.K.)
- New York Academy of Science
- American Society of Agronomy
- Editorial Board, *Plant Physiology*, 1990 - 1992, 1995-Present

- Editorial Board, *Plant and Soil*, 1994 - 2000
- Editorial Board, *Planta*, 1995- 2001
- USDA-NRI Competitive Grant Panel (Plant Responses to the Environment), 1992, 1994
- Panel Manager, Plant Responses to the Environment, USDA-NRI Competitive Grants Program, 1995
- Editorial Board, *Annual Review of Plant Physiology*, 1996-2001
- Executive Committee, American Society of Plant Biologists, 2009-present
- Chair, International Committee, American Society of Plant Biologists, 2009-present

Cornell Service

- I have served or are serving as Major Professor for 20 Ph.D. students (16 in Plant Biology, 3 in CSS, 1 in Env. Toxicology) and 1 MS student (CSS)
- I have served as a minor member on numerous Ph.D thesis committees in Plant Biology, SCAS, Fruit and Vegetable Crops, Natural Resources)
- I created and teach the graduate course in plant mineral nutrition (CSS/Bio Pl 642)
- I have taught a number of seminar courses in Plant Biology, as well as contributed to the team-taught Advanced Plant Physiology Lab (Bio Pl 643)
- I serve on the Cornell Genomics Task Force
- I have served on a number of *ad hoc* committees relating to genomics and biotechnology for Cornell, as well as on a number of faculty search committees in Plant Biology and Boyce Thompson Institute.

Publications:

1. Hallenbeck PC, LV Kochian, JC Weissman, and JR Benemann. 1978. Solar energy conversion with hydrogen-producing cultures of the blue-green alga, Anabaena cylindrica. Biotechnology and Bioengineering 8: 283-297.

2. Hallenbeck PC, LV Kochian, and JR Benemann. 1981. Hydrogen evolution catalyzed by hydrogenase in cultures of cyanobacteria. Zeit. Naturforsch 36: 87-92.

3. Kochian LV, and WJ Lucas. 1982. Potassium transport in corn roots. I. Resolution of kinetics into a saturable and linear component. Plant Physiol 70: 1723-1731.

4. Kochian LV, and WJ Lucas. 1982. A reevaluation of the carrier-kinetic approach to ion transport in roots of higher plants. What's New in Plant Physiology 13: 45-48.

5. Kochian LV, and WJ Lucas. 1983. Potassium transport in corn roots. II. The significance of the root periphery. Plant Physiol 73: 208-216.

6. Kochian LV, and WJ Lucas. 1984. The significance of the linear component for K^+ influx in corn roots. In: Plant Membrane Transport, eds., WJ Cram, R Rybova, K Janacek. Academia, Publishing House of the Czechoslovak Academy of Science, Prague. pp. 410-411.

7. Kochian LV, and WJ Lucas. 1985. Potassium transport in corn roots. III. Perturbation by exogenous NADH and ferricyanide. Plant Physiol 77: 429-436.

8. Kochian LV, J Xin-Zhi, and WJ Lucas. 1985 . Potassium transport in corn roots. IV. Characterization of the linear component. Plant Physiol 79: 771-776.

9. Lucas WJ, and Kochian, LV. 1986. Ion transport processes in cornroots: An approach utilizing microelectrode techniques. In: Advanced Agricultural Instrumentation. eds., W Gensler, M Nijhoff, The Hague. pp. 402-425.

10. Newman IA, LV Kochian, MA Grusak, and WJ Lucas. 1987. Fluxes of H^+ and K^+ in corn roots: Characterization and stoichiometries using ion-selective microelectrodes. Plant Physiol 84: 1177-1184.

11. Kochian LV, and Lucas, WJ. 1987. Investigating root ion transport processes: An integrated experimental approach. In: Electron Transfer Constituents of the Eukaryotic Plasma Membrane. ed. JM Ramirez, Spanish Research Council, Madrid. pp. 155-173.

12. Lucas WJ, and Kochian, LV. 1987. Influence of exogenous NADH on K^+ and H^+ transport in corn roots. In: Electron Transfer Constituents of the Eukaryotic Plasma Membrane. ed. JM Ramirez, Spanish Research Council, Madrid. pp. 175-193.

13. Kochian LV, and WJ Lucas. 1988. Potassium transport in roots. In: Advances in Botanical Research, Vol. 15. CA Callow and HW Woolhouse, eds. Academic Press, London, pp 93-178.

14. Lucas WJ, and LV Kochian. 1988. Mechanisms of ion transport in plants: K^+ as an example. In: Plasma Membrane Oxidoreductases in Control of Animal and Plant Growth, eds. FL Crane, H Löw, and DJ Moore, Plenum Press, New York, pp. 219-232.

15. Kochian LV, JE Shaff, and WJ Lucas. 1989. High-affinity K^+ uptake in maize roots: A lack of coupling with H^+ efflux. Plant Physiol 91:1202-1211.

16. DiTomaso JM, JE Shaff, and LV Kochian. 1989. Putrescine-induced wounding and its effect on membrane integrity and ion transport processes in roots of intact corn seedlings. Plant Physiol 90: 988-905.

17. Miyasaka SC, LV Kochian, JE Shaff, and CD Foy. 1989. Mechanisms of aluminum tolerance: An investigation of genotypic differences in rhizosphere pH, potassium and proton fluxes, and membrane potentials. Plant Physiol 91: 1188-1196.

18. Grusak, MA, RM Welch, and LV Kochian. 1989. A transport mutant for the study of iron absorption in plants. Plant Membrane Transport: The Current Position. J. Dainty, M.I. deMichelis, E. Marre, and F. Rasi-Caldogno, (eds.), Elsevier Press, Amsterdam, pp. 61-66.

19. Kochian LV, IA Newman, and WJ Lucas. 1990. Ion transport in corn roots: Localized stoichiometries for H^+, K^+, and Cl^- In: Membrane Transport in Plants and Fungi. M.J. Beilby, N.A. Walker, J.R. Smith, eds. University of Sydney Press, Sydney, Australia, pp. 119-123.

20. Grusak, MA, LV Kochian, and RM Welch. 1990. A transport mutant of pea (*Pisum sativum*) for the study of iron absorption in higher plant roots. In: Plant Nutrition - Physiology and Applications. M.L. van Beusichem, ed. Kluwer Academic Publishers, pp.

219-222.

21. McClure PR, LV Kochian, RM Spanswick, and JE Shaff. 1990. Evidence for cotransport of nitrate and protons in maize roots. I. Response of the root-cell membrane potential to nitrate. Plant Physiol 93: 281-289.

22. McClure PR, LV Kochian, RM Spanswick, and JE Shaff. 1990. Evidence for cotransport of nitrate and protons in maize roots. II. Measurement of NO_3^-/H^+ fluxes with ion-selective microelectrodes. Plant Physiol 93: 290-294.

23. Grusak MA, RM Welch, and LV Kochian. 1990. Physiological characterization of a single-gene mutant of *Pisum sativum* exhibiting excess iron accumulation. I. Root iron reduction and iron uptake. Plant Physiol 93: 976-981.

24. Grusak MA, RM Welch, and LV Kochian. 1990. Does iron deficiency enhance the activity of the root-cell plasmalemma iron transport protein? Plant Physiol 94: 1353-1357.

25. DiTomaso, JM and LV Kochian. 1991. Putrescine transport in roots of intact maize seedlings: Kinetic analyses, compartmentation, and involvement in metabolism. In: Polyamines and Ethylene: Physiology, Biochemistry, and Interactions, pp. 48-51.

26. DiTomaso JM, PH Brown, AE Stowe, DL Linscott, and LV Kochian. 1991. Effects of diclofop and diclofop-methyl on membrane potentials in roots of intact oat, maize, and pea seedlings. Plant Physiol 95: 1063-1069.

27. Kochian, LV. 1991. Mechanisms of micronutrient uptake and translocation in plants. In: Micronutrients in Agriculture, Second Edition, JJ Mortvedt, FR Cox, LM Shuman, and RM Welch, eds., Soil Science Society of America, Madision, WI, pp. 229-296.

28. Kochian, LV and WJ Lucas. 1991. Do plasmalemma oxidoreductases play a role in plant mineral ion transport? In: Oxidoreductases at the Plasma Membrane: Relation to Growth and Development; Volume Plants, FL Crane, DJ Morre and H Low, eds., CRC Press, Boca Raton, pp 189-205.

29. Kochian, LV and JE Shaff. 1991. Investigating the relationship between aluminum toxicity, root growth, and root-generated ion currents. In: Plant-Soil Interactions at Low pH, RI Wright, VC Baligar, RP Murrmann, eds., Kluwer Academic Publishers, Netherlands, pp 769-778.

30. Kochian, LV, JE Shaff, and PR Ryan. 1991. Microelectrode-based investigations into the relationship between Al toxicity and root-cell membrane transport processes. Current Topics in Plant Biochem Physiol, 10: 117-133.

31. Anderson, JA, SS Huprikar, LV Kochian, WJ Lucas, and RF Gaber. 1992. Functional expression of a probable *Arabidopsis thaliana* potassium channel in *S. cerevisiae*. Proc. Natl. Acad. Sci. USA 89: 3736-3740.

32. Huang, JW, JE Shaff, DL Grunes, and LV Kochian. 1992. Al effects on calcium fluxes at the root apex of Al-tolerant and Al-sensitive wheat cultivars. Plant Physiology 98:230-237.

33. DiTomaso, JM, JJ Hart, and LV Kochian. 1992. Transport kinetics and metabolism of exogenously applied putrescine in roots of intact maize seedlings. Plant Physiology 98:611-620.

34. Ryan, PR, JE Shaff, and LV Kochian. 1992. Aluminum toxicity in roots: Correlation between ionic currents, ion fluxes and root elongation in Al-sensitive and Al-tolerant wheat cultivars. Plant Physiol 99: 1193-1200.

35. Glass, ADM, JE Shaff, and LV Kochian. 1992. Studies of the uptake of nitrate in barley. 4. Electrophysiology. Plant Physiol 99: 456-463.

36. DiTomaso, JM, JJ Hart, DL Linscott and LV Kochian. 1992. Effect of inorganic cations and metabolic inhibitors on putrescine transport in roots of intact maize seedlings. Plant Physiol 99: 508-514.

37. Kinraide, TB, PR Ryan, and LV Kochian. 1992. Interactive effects of Al^{3+}, H^{+}, and other cations on root elongation considered in terms of cell-surface electrical potential. Plant Physiol 99: 1461-1467.

38. Lauver, TL, DC McCune, JE Shaff, and LV Kochian. 1992. The use of ion-selective microelectrodes for measuring calcium and hydrogen ion transfer between foliar surfaces and simulated rain solutions. New Phytol 121: 179-185.

39. Hart, JJ, JM DiTomaso, DL Linscott, and LV Kochian. 1992. Transport interactions between paraquat and polyamines in roots of intact maize seedlings. Plant Physiol 99: 1400-1405.

40. Huang, JW, DL Grunes, and LV Kochian. 1992. Aluminum effects on the kinetics of calcium uptake into cells of the wheat root apex. Quantification of calcium fluxes using a calcium-selective vibrating microelectrode. Planta 188: 414-421.

41. Kochian, LV, JE Shaff, W Kühtreiber, LF Jaffe, and WJ Lucas. 1992. Use of an extracellular vibrating ion-selective microelectrode system for the quantification of K^{+}, H^{+} and Ca^{2+} fluxes in maize roots and maize suspension cells. Planta 188: 601-610.

42. Welch, RM and LV Kochian. 1992. Regulation of iron accumulation in food crops: Studies using single gene pea mutants. In: Biotechnology and Nutrition: Proceedings of the Third International Symposium, DD Bills, S-D Kung, eds., Butterworth-Heinemann, Boston, pp. 325-344.

43. Hart, JJ, JM DiTomaso, DL Linscott, and LV Kochian. 1992. Characterization of the transport and cellular compartmentation of paraquat in intact maize seedlings. Pest Biochem Physiol 43: 212-219.

44. Zobel RW, LV Kochian, and TG Toulemonde. 1993. Plant root systems. Proceedings of Roots of Plant Nutrition Conference, Potash and Phosphate Institute, pp. 30-40.

45. Ryan, PR, JM DiTomaso, and LV Kochian. 1993. Aluminum toxicity in roots. An investigation of spatial sensitivity and the role of the root cap. J Exp. Bot 44: 437-446.

46. Grusak MA, LV Kochian, and RM Welch. 1993. Spatial and temporal developement of

iron(III) reductase activity in root systems of *Pisum sativum* L. challenged with iron-deficiency stress. Am J Bot 80: 300-308.

47. Huang JW, DL Grunes, and LV Kochian. 1993. Aluminum effects on calcium ($^{45}Ca^{2+}$) translocation in aluminum-tolerant and aluminum-sensitive wheat cultivars. Differential responses of the root apex versus mature root regions. Plant Physiol 102: 85-93.

48. Hart JJ, JM DiTomaso, DL Linscott, and LV Kochian. 1993. Investigations into the cation specificity and metabolic requirements for paraquat transport in roots of intact maize seedlings. Pest Biochem Physiol 45: 62-71.

49. Huang JW, DL Grunes, and LV Kochian. 1993. Aluminum effects on ^{45}calcium-labeled calcium uptake and translocation in wheat forages. Agron J 85: 867-873.

50. Welch, RM, Norvell WA, Schaefer SS, Shaff JE and LV Kochian. 1993. Induction of iron(III) and copper(II) reduction in pea (*Pisum sativum* L.) roots by Fe and Cu status: Does the root-cell plasmalemma Fe(III) chelate reductase perform a general role in regulating cation uptake? Planta 190: 555-561.

51. Ryan, PR, and LV Kochian. 1993. Aluminum differentially inhibits uptake into the root apex of near-isogenic lines of wheat: A possible mechanism of toxicity. Plant Physiol 102: 975-982.

52. DiTomaso, JM, JJ Hart, and LV Kochian. 1993. Compartmentation analysis of paraquat fluxes in maize roots as a means of estimating the rate of vacuolar accumulation and translocation to shoots. Plant Physiol 102: 467-472.

53. Ryan, PR, TB Kinraide, LV Kochian. 1993. Al^{3+}-Ca^{2+} interactions in aluminum rhizotoxicity. I. Inhibition of root growth is not caused by reduction of calcium uptake. Planta 102: 98-103.

54. Kinraide, TB, PR Ryan, LV Kochian. 1993. Al^{3+}-Ca^{2+} interactions in aluminum rhizotoxicity. II. Evaluating the Ca^{2+} displacement hypothesis. Planta 102: 104-108.

55. Norvell WA, RM Welch , ML Adams and LV Kochian. 1993. Reduction of Fe(III), Mn(II) and Cu(II) chelates by roots of pea *(Pisum sativum* L.) or soybean (*Glycine max*). In: *Plant Nutrition - From Genetic Engineering To Field Practice*, NJ Barrow, ed., Kluwer Academic Publishers, pp. 129-132.

56. Kochian LV, DF Garvin, JE Shaff, TC Chilcott, and WJ Lucas. 1993. Towards an understanding of the molecular basis of plant K^+ transport: characterization of cloned K^+ transport cDNAs. In: *Plant Nutrition - From Genetic Engineering To Field Practice*, NJ Barrow, ed., Kluwer Academic Publishers, pp. 121-124.

57. Hart JJ, JM DiTomaso, and LV Kochian. 1993. Characterization of paraquat transport in protoplasts from maize (*Zea mays* L.) suspension cells. Plant Physiol 103: 963-969.

58. Dotray, PA, JM DiTomaso, JW Gronwald, DL Wyse, and LV Kochian. 1993. Effects of acetyl-coenzyme A carboxylase inhibitors on root cell transmembrane electric potentials in sethoxydim-tolerant and -susceptible corn. Plant Physiol 103: 919-924.

59. Kochian LV. 1993. Zinc absorption from hydroponic solutions by plant roots. In: *Zinc in Soils and Plants*, AD Robson, ed., Kluwer Academic Publishers, pp. 45-57.

60. Kochian LV, DF Garvin, JE Shaff, TC Chilcott, and WJ Lucas. 1993. Towards an understanding of the molecular basis of plant K^+ transport: characterization of cloned K^+ transport cDNAs. Plant Soil 155/156: 115-118

61. Grunes DL, Ohno T, Huang JW and Kochian LV. 1994. Effects of aluminum on magnesium, calcium and potassium in wheat forages. In *Magnesium 1993*. S Golf, D Dralle and L Vecchiet, eds., John Libbey and Company, Ltd., pp. 79-88.

62. Huang JW, DL Grunes, and LV Kochian. 1994. Calcium transport in right-side-out plasma membrane vesicles isolated from wheat roots. Characterization of a voltage-gated calcium channel. Proc Nat Acad Sci USA 91: 3473-3477.

63. Wang MY, ADM Glass, JE Shaff and LV Kochian. 1994. Ammonium uptake by rice roots. III. Electrophysiology. Plant Physiol 104: 899-906.

64. Kochian LV, Jones DL and Shaff JE. 1994. The role of ion transport processes in root hair tip growth in *Limnobium stoloniferum*. In: *Pollen-Pistil Interactions and Pollen Tube Growth*, AG Stephenson, T-H Kao, eds., American Society of Plant Physiologists, pp. 150-160.

65. Kochian LV. 1995. Cellular mechanisms of aluminum toxicity and resistance in plants. Annu Rev Plant Physiol Plant Mol Biol 46: 237-260.

66. Huang JW, DL Grunes and LV Kochian. 1995. Aluminum and calcium transport interactions in intact roots and root plasmalemma vesicles from aluminum-sensitive and tolerant wheat cultivars. Plant Soil 171: 131-135.

67. Pellet DM, DL Grunes and LV Kochian. 1995. Organic acid exudation as a mechanism of Al-tolerance in *Zea mays*. Planta 197: 788-795.

68. Chilcott TC, S Frost-Shartzer, MW Iverson, DF Garvin, LV Kochian and WJ Lucas. 1995. Potassium transport kinetics of *KAT1* expressed in *Xenopus* oocytes: A proposed molecular structure and field effect mechanism for membrane transport. C.R. Acad. Sci. Paris, Life Sciences 318: 761-771.

69. Jones DL, JE Shaff and LV Kochian. 1995. Role of calcium and other ions in directing root hair tip growth in *Limnobium stoloniferum*. I. Inhibition of tip growth by aluminum. Planta 197: 672-680.

70. Jones DL and LV Kochian. 1995. Aluminum inhibition of the Ins(1,4,5)P_3 signal transduction pathway in wheat roots: A role in aluminum toxicity? The Plant Cell 7: 1913-1922.

71. Huang JW, D Pellet and LV Kochian. 1995. Aluminum interactions with voltage-dependent calcium transport in plasma membrane vesicles derived from roots of Al-sensitive and resistant wheat cultivars. Plant Physiol 110: 561-569.

72. Larsen PB, Tai C-Y, Kochian LV, Howell SH. 1995. Arabidopsis mutants with increased

sensitivity to aluminum show altered aluminum accumulation and toxicity responses. Plant Physiol 110: 743-751

73. Lasat MM, JM DiTomaso, JJ Hart and LV Kochian. 1996. Resistance to paraquat in *Hordeum glaucum* is temperature dependent and not associated with enhanced apoplasmic binding. Weed Res 36: 303-309.

74. Fox TC, JE Shaff, MA Grusak, WA Norvell, Y Chen, RL Chaney and LV Kochian. 1996. Direct measurement of ^{59}Fe-labeled Fe^{2+} influx in roots of *Pisum sativum* using a chelator buffer system to control free Fe^{2+} in solution. Plant Physiol 111: 93-100.

75. Jones DL, PR Darrah and LV Kochian. 1996. Critical evaluation of organic acids mediated iron dissolution in the rhizosphere and its potential role in root iron uptake. Plant Soil 180: 57-66.

76. Pellet, DM, LA Papernik, Kochian LV. 1996. Multiple aluminum resistance mechanisms in wheat: The role of root apical phosphate and malate exudation. Plant Physiology 112: 591-597.

77. Romera FJ, RM Welch, WA Norvell, SC Schaefer and LV Kochian. 1996. Ethylene involvement in the overexpression of Fe(III)-chelate reductase by roots of *E107* pea [*Pisum sativum* L. (*brz,brz*)] and *chloronerva* tomato (*Lycopersicon esculentum* L.) mutant genotypes. BioMetals 9: 38-44.

78. Jones DL and LV Kochian. 1996. Aluminum-organic acid interactions in acid soils. I. Effect of root derived organic acids on the kinetics of Al dissolution. Plant Soil 182: 221-228.

79. Jones DL, AM Probowo and LV Kochian. 1996. Aluminum-organic acid interactions in acid soils. II. Influence of solid phase sorption on organic acid-Al complexation and Al rhizotoxicity. Plant Soil 182: 229-237.

80. Jones DL, AM Probowo and LV Kochian. 1996. Kinetics of malate transport and decomposition in acid soils and isolated bacterial populations: The effect of microorganisms on root exudation of malate under Al stress. Plant Soil 182: 239-247.

81. Lasat MM, AJM Baker and LV Kochian. 1996. Physiological characterization of root Zn^{2+} absorption and translocation to shoots in Zn hyperaccumulator and nonaccumulator species of *Thlaspi*. Plant Physiol 112: 1715-1722

82. Smart CJ, DF Garvin, JP Prince, WJ Lucas and LV Kochian. 1997. The molecular basis of potassium nutrition in plants. Plant Soil 187: 81-89.

83. Lasat MM, JM DiTomaso, JJ Hart and LV Kochian. 1997. Paraquat resistance in wall barley (*Hordeum glaucum* Steud.) Is correlated to increased vacuolar sequestration. Physiol Plantarum 99: 255-262.

84. Jones DL and LV Kochian. 1997. Aluminum interactions with plasma membrane lipids and enzyme metal binding sites and its potential role in Al cytotoxicity. FEBS Lett. 400: 51-57.

85. Ebbs SD and LV Kochian. 1997. Toxicity of zinc and copper to Brassica species: Implications for phytoremediation. J Env Quality 26: 776-781.

86. Cohen CK, Norvell WA and LV Kochian. 1997. Induction of the root-cell plasma membrane ferric reductase: An exclusive role for Fe and Cu. Plant Physiol 114: 1061-1069.

87. Kochian LV and Jones DL. 1997. Aluminum toxicity and resistance in plants. In: Research Issues in Aluminum Toxicity, eds. R. Yokel and M.S. Golub, Taylor and Francis, Publishers, Washington, D.C., pp 69-89.

88. Halperin, SJ, LV Kochian, and JP Lynch. 1997. Salinity stress inhibits calcium loading into the xylem of excised barley (*Hordeum vulgare*) roots. New Phytol 135: 419-427.

89. Larsen, PB, LM Stenzler, C-Y Tai, J Degenhardt, SH Howell, and LV Kochian. 1997. Molecular and physiological analysis of Arabidopsis mutants exhibiting altered sensitivities to aluminum. Plant Soil 192: 3-7

90. Pellet DM, LA Papernik, DA Jones, PR Darrah, DL Grunes and LV Kochian. 1997. Involvement of multiple aluminum exclusion mechanisms in aluminum resistance in wheat. Plant Soil 192: 63-68

91. Ebbs SD, Lasat MM, Brady DJ, Cornish J and LV Kochian. 1997. Phytoextraction of Cd and Zn from a contaminated soil. J Env Qual 26: 1424-1430

92. Larsen PB, LV Kochian and SH Howell. 1997. Aluminum inhibits both shoot development and root growth in *Als3*, an unusual aluminum-sensitive Arabidopsis mutant. Plant Physiol 114: 1207-1214

93. Papernik LA and LV Kochian. 1997. Possible involvement of Al-induced electrical signals in aluminum tolerance in wheat. Plant Physiol 115: 657-667

94. Lasat MM, WA Norvell and LV Kochian. 1997. Potential for phytoextraction of ^{137}Cs from a contaminated soil. Plant Soil 195: 99-106

95. Jones DL, LV Kochian and S Gilroy. 1998. Aluminum induces a decrease in cytosolic [Ca^{2+}] in BY-2 tobacco cell cultures. Plant Physiol 116: 81-89.

96. Lasat MM, M Fuhrman, SD Ebbs, J Cornish and LV Kochian. 1998. Phytoremediation of a radiocesium-contaminated soil. Evaluation of ^{137}Cs bioaccumulation in the shoots of three plant species. J Env Qual 27: 165-169.

97. Ebbs S, Lasat M and L Kochian. 1998. Phytoremediation of radionuclide-contaminated soils: Field, greenhouse and laboratory studies. In: Phytoremediation. C.A. Thibeault and LM Savage, eds., IBC Library Series, Southborough, MA. pp. 213-235

98. Cohen CK , TC Fox, DF Garvin and LV Kochian. 1998. The role of iron deficiency stress reponses in stimulating heavy metal transport in plants. Plant Physiol 116: 1063-1072.

99. Pineros MA, JE Shaff and LV Kochian. 1998. Development, characterization and application of a cadmium-selective microelectrode for the measurement of cadmium

fluxes in roots of *Thlaspi* species and wheat. Plant Physiol 116: 1393-1401.

100. Ebbs SD and LV Kochian. 1998. Phytoextraction of zinc by oat (*Avena sativa*), barley (*Hordeum vulgare*) and indian mustard (*Brassica juncea*). Environ Sci Tech 32: 802-806.

101. Larsen, PB, J Degenhardt, C-Y Tai, L Stenzler, SH Howell and LV Kochian. 1998. Aluminum-resistant Arabidopsis mutants that exhibit altered patterns of Al accumulation and organic acid release from roots. Plant Physiol 117: 9-18.

102. Degenhardt J, Larsen PB, Howell SE and LV Kochian. 1998. Aluminum resistance in the Arabidopsis mutant *alr*-104 is caused by an aluminum-induced increase in rhizosphere pH. Plant Physiol 117: 19-27.

103. Hart JJ, Welch RM, Norvell WA, Sullivan LA and LV Kochian. 1998. Characterization of cadmium binding, uptake and translocation in intact seedlings of bread and durum wheat cultivars. Plant Physiol 116: 1413-1420.

104. Ebbs SD, DJ Brady and LV Kochian. 1998. Role of uranium speciation in the uptake and translocation of uranium by plants. J Exp Botany 49: 1183-1190.

105. Jones DL, S Gilroy, PB Larsen, SH Howell and LV Kochian. 1998. Effect of aluminum, oxidative, anaerobic and mechanical stress on cytoplasmic Ca^{2+} homeostasis in root hairs of *Arabidopsis thaliana*. Planta 206: 378-387.

106. Lasat MM and LV Kochian. 1998. Physiological basis for Zn^{2+} hyperaccumulation in *Thlaspi caerulescens*. In *Radical Biology: Advances and Perspectives on the Function of Plant Roots*, HE Flores, JP Lynch, D Eissenstat, eds. American Society of Plant Physiologists, pp. 139-149.

107. Ebbs SD, MM Lasat, LV Kochian, J Cornish, G Huddleston and M Fuhrmann. 1998. Phytoremediation of radionuclide contaminated soils - field, greenhouse and laboratory studies. In: *Phytoremediation*, IBC Library Series, Southborough, MA. Pp. 213-235

108. Ebbs SD, WA Norvell and LV Kochian. 1998. Effect of acidification and chelating agents on the solubilization of uranium from contaminated soil. J Envir Qual 27: 1486-1494

109. Lasat MM, AJM Baker and LV Kochian. 1998. Altered zinc compartmentation in the root symplasm and stimulated Zn^{2+} absorption in to the leaf as mechanisms involved in zinc hyperaccumulation in *Thlaspi caerulescens*. Plant Physiol 118: 875-883

110. Pineros MA, JE Shaff, LV Kochian and E Bakker. 1998. Selectivity of liquid membrane cadmium microelectrodes based on the ionophore N, N, N', N'-tetrabutyl-3,6-dioxaoctanedithioamide. Electroanalysis 10: 937-941.

111. Hart JJ, Norvell WA, Welch RM, Sullivan LA and Kochian LV. 1998. Characterization of zinc uptake, binding, and translocation in intact seedlings of bread and durum wheat cultivars. Plant Physiology 118: 219-226.

112. Lasat MM and LV Kochian. 1999. Physiology of Zn hyperaccumulation in *Thlaspi caerulescens*. In *Phytoremediation*, N Terry and GS Banuelos, eds., Ann Arbor Press, Chelsea, MI.

113. Kochian LV. 1999. Physiological mechanisms of aluminum tolerance in crop plants. In: (R. Schaffert, ed.) Proceedings of a workshop to develop a strategy for collaborative research and dissemination of technology in sustainable crop production in acid savannahs and other problem soils of the world. Purdue University Press, Indiana. pp. 69-72.

114. Kochian LV and DF Garvin. 1999. Agricultural approaches to improving phytonutrient content in plants: An overview. Nut Reviews 57: 13-18.

115. Welch, R.M., Hart, J.J., Norvell, W.A., Sullivan, L.A., Kochian, L.V. 1999. Effects of nutrient solution zinc activity on net uptake, translocation, and root export of cadmium and zinc by separated sections of intact durum wheat (*Triticum turgidum* L. var. durum) seedling roots. Plant Soil 208: 243-250.

116. Murphy AS, Eisinger WR, Shaff JE, Kochian LV, and L Taiz. 1999. Early copper-induced leakage of K^+ from Arabidopsis seedlings is mediated by ion channels and coupled to citrate efflux. Plant Physiol 121: 1375-1382.

117. Lasat MM, NS Pence, DF Garvin, SD Ebbs and LV Kochian. 2000. Molecular physiology of zinc transport in the Zn hyperaccumulator *Thlaspi caerulescens*. J Exp Bot 51: 71-79

118. Ebbs S, L Kochian, Lasat M, N Pence and T Jiang. 2000. An integrated investigation of the phytoremediation of heavy metal and radionuclide contaminated soils: From the laboratory to the field. In *Remediation of Hazardous Wastes and Contaminated Soils*, 2cd Edition, DL Wise, DJ Trantolo, HI Inyang and EJ Cichon, eds. Marcel Dekker, Inc., New York, NY, pp. 745-769

119. Pence NS, Larsen PB, Ebbs SD, Lasat MM, Letham DLD, Garvin DF, Eide D and LV Kochian, 2000. The molecular basis for heavy metal hyperaccumulation in *Thlaspi caerulescens*. Proc Natl Acad Sci USA 97: 4956-4960

120. Cakmak I, Welch RM, J Hart, Norvell WA, Ozturk L, and LV Kochian. 2000. Uptake and re-translocation of leaf-applied cadmium (^{109}Cd) in diploid, tetraploid and hexaploid wheats. J Exp Bot 51: 221-226

121. Kochian LV. 2000. Can we gain insights into mechanisms of P efficiency by studying aluminum tolerance in crop plants? Proceedings of a Workshop on Improving Phosphorus Acquisition Efficiency in Marginal Soils". EMBRAPA, Sete Lagoas, Brazil

122. Tang Y, Sorrells ME, Kochian LV and DF Garvin. 2000. Identification of RFLP markers linked to barley aluminum tolerance gene *Alp*. Crop Sci 40: 778-782

123. Cakmak, I., Welch, R.M., Erenoglu, B., Romheld, V., Norvell, W.A., Kochian, L.V. 2000. Influence of varied zinc supply on re-translocation of cadmium (^{109}Cd) and rubidium (^{86}RB) applied on mature leaf of durum wheat seedlings. Plant Soil 219: 279-284.

124. Kochian LV. 2000. Chapter 23: Molecular physiology of mineral nutrient acquisition, transport and utilization. In: Biochemistry and Molecular Biology of Plants. Bob B. Buchanan, Wilhelm Gruissem and Russell L. Jones, eds. American Society of Plant Physiologists, pp. 1204-1249.

125. Pineros MA, Kochian LV. 2001. A patch clamp study on the physiology of aluminum toxicity and tolerance in *Zea mays*: Identification and characterization of Al^{3+}-induced anion channels. Plant Physiol 124: 1-14.

126. Hacisalihoglu G. Hart JJ, Kochian LV. 2001. High and low affinity zinc transport systems and their possible role in zinc efficiency in bread wheat (*Triticum aestivum* L.). Plant Physiol 125: 1-8.

127. Papernik LA, Bethea AS, Singleton TE, Magalhaes JV, Garvin DF and Kochian LV. 2001. Physiological basis of reduced Al tolerance in ditelosomic lines of Chinese Spring wheat. Planta 212: 829-834

128. Wang, Y.-H., Garvin D.F., and Kochian L.V. 2001. Nitrate-induced genes in tomato roots: Array analysis reveals novel genes that may play a role in nitrogen nutrition. Plant Physiology 127: 345-359.

129. Lasat MM, Pence NS, Letham DLD, and Kochian LV. 2001. Zinc phytoextraction in *Thlaspi caerulescens*. Int J Phytoremediation 3: 129-144.

130. Pineros MA, and Kochian LV. 2001. H^+ currents around plants. In: Handbook of Plant Growth. PH as a Master Variable in Plant Growth. Marcel Dekker, Inc., New York. Chapter 12, pp. 299-322.

131. Ebbs SD, Lau I, Ahner B, and LV Kochian. 2002. Phytochelatin synthesis is not responsible for Cd tolerance in the Zn/Cd hyperaccumulator, *Thlaspi caerulescens*. Planta 214: 635-640.

132. Hart JJ, Welch RM, Norvell WA, and Kochian LV. 2002. Measurement of thiol-containing amino acids and phytochelatins via capillary electrophoresis with laser-induced fluorescence detection. Electrophoresis 23: 81-87.

133. Pineros MA, Magalhaes JV, Alves VM, and Kochian LV. 2002. A physiological and biophysical examination of aluminum tolerance in maize suggests the existence of multiple tolerance mechanisms. Plant Physiol 129: 1194-120.

133. Tang Y, BF Carver, ME Sorrells, LV Kochian and DF Garvin. 2002. Physiological genetics of mechanisms associated with aluminum tolerance in the wheat cultivar Atlas 66. Crop Sci 42: 1541-1546.

135. Wang, Y-H., Garvin D.F., and Kochian L.V. 2002. Rapid induction of regulatory and transporter genes in response to phosphorous, potassium and iron deficiencies in tomato roots. Evidence for cross talk and root/rhizosphere mediated signals. Plant Physiol 130: 1361-1370.

136. Kochian LV, Pence NS, Letham DLD, Pineros MA, Magalhaes JV, Hoekenga OA, and Garvin DF. 2002. Mechanisms of toxic metal resistance in plants: Aluminum and heavy metals. Plant and Soil 247: 109-119.

137. Fuhrmann M, Lasat ML, Ebbs SD, Kochian LV, and J Cornish. 2002. Uptake of cesium-137 and strontium-90 from contaminated soil by three plant species: Application to

phytoremediation. J Envir Qual 31: 904-909.

138. Garg AK, Kim J-K, Owens TG, Ranwala AP, Choi YD, Kochian LV, and RJ Wu. 2002. Trehalose accumulation in rice plants confers high tolerance levels to different abitoic stresses. Proc Natl Acad Sci USA 99: 15898- 15903.

139. Hart JJ, Welch RM, Norvell WA, Kochian LV. 2002. Transport interactions between cadmium and zinc in roots of bread and durum wheat seedlings. Physiol Plant 116: 73-78.

140. Hacisalihoglu G, JJ Hart, Y-H Wang, I Cakmak, and LV Kochian. 2003. Zinc efficiency is correlated with enhanced expression and activity of Zn-requiring enzymes in wheat. Plant Physiology 131: 595-602.

141. Pineros, MA and LV Kochian. 2003. Differences in whole cell and single channel ion currents across the plasma membrane of mesophyll cells from two closely related *Thlaspi* species. Plant Physiology 131: 583-594.

142. Wang Y-H, Kochian LV, Doyle JF, and Garvin DF. 2003. Differential regulation of two tomato nonsymbiotic hemoglobin genes in response to diverse changes in nutrient status. Plant Cell Environ 26: 673-680.

143. Levent O, Cakmak I, and LV Kochian. 2003. Shoot biomass and zinc/cadmium uptake for hyperaccumulator and non-accumulator *Thlaspi* species in response to growth on a zinc-deficient calcareous soil. Plant Science 164: 1065-1071.

144. Hoekenga OA, Vision TJ, Shaff JE, Monforte AJ, Lee GP, Howell SH, and LV Kochian. 2003. Identification and characterization of Al tolerance loci in *Arabidopsis thaliana* (Landsberg x Columbia) by quantitative trait locus mapping: A physiologically simple but genetically complex trait. Plant Physiology 132: 936-948.

145. Hacisalihoglu G, and LV Kochian. 2003. How do some plants tolerate low levels of soil zinc? Mechanisms of zinc efficiency in crop plants. New Phytologist 159: 341-350.

146. Raman H, Karakousis A, Moroni JS, Raman R, Read BJ, Garvin DF, Kochian LV, and Sorrells ME. 2003. Development and allele diversity of microsatellite markers linked to the barley aluminum tolerance gene ALP. Australian Journal of Agricultural Research 54: 1315-1321.

147. Fuhrmann M, Lasat M, Ebbs S, Cornish J, L Kochian. 2003. Uptake and release of cesium-137 by five plant species as influenced by soil amendments in field experiments. J Environ Qual 32: 2272-2279.

148. Hacisalihoglu G, Ozturk L, Cakmak I, Welch RM, and Kochian LV. 2003. Genotypic variation in common bean in response to zinc deficiency in calcareous soil. Plant Soil 259: 71-83.

149. Kochian LV, Hoekenga OA, Pineros MA. 2004. How do crop plants tolerate acid soils? Mechanisms of aluminum tolerance and phosphorous efficiency. Ann. Rev. Plant Biol. 55: 459-493

150. Hacisalihoglu G, Hart JJ, Vallejos E and Kochian LV. 2004. The role of shoot-localized processes in the mechanism of Zn efficiency in common bean. Planta 218: 704-711

151. Cohen CK, Garvin DF, and Kochian LV. 2004. Kinetic properties of a micronutrient transporter from *Pisum sativum* indicate a primary function in Fe uptake from the soil. Planta 218: 784-792.

152. Magalhaes JV, Garvin DF, Sorrells ME, Klein PE, Schaffert RE, Wang Y-H, Li L, and LV Kochian. 2004. Comparative mapping of a major aluminum tolerance gene in sorghum and other species in the Poaceae. Genetics 167: 1905-1914.

153. Huang JH, Poynton CY, Kochian LV, and Elless MP. 2004. Phytofiltration of arsenic from drinking water using an arsenic-hyperaccumulating fern. J Env Qual 38: 3412-3417.

154. Poynton CY, Huang JW, Blaylock MJ, Kochian LV, and MP Elless. 2004. Mechanisms of arsenic hyperaccumulation in *Pteris* species: Root As influx and translocation. Planta 219: 1080-1088.

155. Papoyan A, and Kochian LV. 2004. Identification of *Thlaspi caerulescens* genes that may be involved in heavy metal hyperaccumulation and tolerance: Characterization of a novel heavy metal transporting ATPase. Plant Physiol 136: 3814-3823.

156. Pineros MA, Shaff JE, Manslank HS, Alves VMC, and LV Kochian. 2005. Aluminum resistance in maize can not be solely explained by root organic acid exudation: A comparative physiological study. Plant Physiol 137: 231-241.

157. Letham DLD, Pence NS, Lasat MM, and LV Kochian. 2005. Molecular and physiological investigations of *Thlaspi caerulescens*, a Zn/Cd hyperaccumulator. In: Roots and Soil Management: Interactions between Roots and the Soil. RF Zobel and SF Wright, eds. Agronomy Society of America Monographs; pp. 95-106.

158. Hart JJ, Welch RM, Norvell WA, Clarke JM, and LV Kochian. 2005. Zinc effects on cadmium accumulation and partitioning in near isogenic lines of durum wheat that differ in grain cadmium concentration. New Phytologist 167: 391-401

159. Kochian LV, Piñeros MA, Hoekenga OA. 2005. The physiology, genetics and molecular biology of plant aluminum resistance and toxicity. Plant and Soil 274: 175-195.

160. Raman H, K Zhang, M Cakir, R Appels, JS Moroni, LG Maron, LV Kochian, R Raman, I Muhammad, F-D Brockman, DF Garvin, I Waters, P Martin, T Sasaki, Y Yamamoto, H Matsumoto, DM Hebb, E Delhaize, and PR Ryan. 2005. Molecular characterization and mapping of *ALMT1*, the aluminium-tolerance gene of bread wheat (*Triticum aestivum* L.). Genome 48: 781-791.

161. Kochian L, Hoekenga OA, Magalhaes J, Pineros M, Alves V, Maron L, Mason P, Guimares C, and Schaffert R. 2005. Integrating genomics, molecular genetic and physiological approaches to identify plant aluminum tolerance genes and their associated physiological mechanisms. In: Plant Nutrition for Food Security, Human Health, and Environmental Protection. CJ Li, FS Zhang et al., eds., Tsinghua University Press, Beijing, China. Pp. 18-20.

162. Liao H, Wan H, Shaff JE, Wang X, Yan X, and Kochian LV. 2006. Phosphorus and aluminum ınteractions in soybean in relation to Al tolerance: Exudation of specific organic acids from different regions of the ıntact root system. Plant Physiol 141: 674-684.

163. Hoekenga OA, Maron LG, Pineros MA, Cancado GMA, Shaff JE, Kobayashi Y, Ryan PR, Dong B, Delhaize E, Sasaki T, Matsumoto H, Koyama H, and LV Kochian. 2006. *AtALMT1* (At1g08430) is a novel, essential factor for aluminum tolerance in Arabidopsis thaliana and encodes an aluminum-activated malate transporter. Proc Natl Acad Sci USA 103: 9738-9743.

164. Jones DL, Blancaflor EB, Kochian LV, and Gilroy S. 2006. Spatial coordination of aluminium uptake, production of reactive oxygen species, callose production and wall rigidification in maize roots. Plant, Cell and Envir. 1309-1318.

165. Caniato FF, Guimarães CT, Schaffert RE, Alves VMC, Kochian LV, Borém A, Klein PE, Magalhaes JV. 2006. Genetic diversity for aluminum tolerance in sorghum. Theor Applied Genetics 114: 863-867.

166. Hart JJ, Welch RM, Norvell, WA, and Kochian LV. 2006. Characterization of cadmium uptake, translocation and storage in near-isogenic lines of durum wheat that differ in grain cadmium concentration. New Phytologist 172: 261-271

167. Kupper H, Seib LO, Sivaguru M, Hoekenga OA, and LV Kochian. 2007. A novel method for quantitative *in situ* hybridization in plants reveals regulation of a zinc transporter in the Cd/Zn hyperaccumulator *Thlaspi caerulescens* (Ganges). The Plant Journal 50: 159-175.

168. Lyi SM, Zhou X,. Kochian LV, Li L. 2007. Biochemical and molecular characterization of the homocysteine S-methyltransferase from broccoli (Brassica oleracea var. italica. Phytochem 68: 1112-1119.

169. Papoyan A, Pineros MA, Kochian LV. 2007. Plant Cd^{2+} and Zn^{2+} status effects on root and shoot heavy metal accumulation in Thlaspi caerulescens. New Phytol 175: 51-58.

170. Magalhaes JM, Liu J, Guimares CT, Lana UGP, Alves VM, Wang Y-H, Schaffert RE, Hoekenga OA, Shaff JE, Pineros MA, Klein PE, and LV Kochian. 2007. A gene in the multidrug and toxic compound extrusion (MATE) family confers aluminum tolerance in sorghum.. Nature Genetics 39: 1156-1161.

171. Kobayasi Y, Hoekenga OA, Ito H, Nakashima M, Saito S, Shaff JE , Maron LG, Piñeros MA, Kochian LV, Koyama H. 2007. Characterization of *AtALMT1* expression in aluminum inducible malate release and its role for rhizotoxic stress tolerance in *Arabidopsis thaliana*. Plant Physiol 145: 843-852.

172. Parameswaran A, Leitenmaier B, Yang M, Welte W, Kroneck PMH, Papoyan A, Kochian LV, Küpper H. 2007. A native Zn/Cd transporting P1B ATPase from natural overexpression in a hyperaccumulator plant reveals post-translational processing. Biochem Biophys Research Comm 363: 51-56.

173. Li, L., Lyi, S.M., Zhou, X., Kochian, L.V. 2007. Biochemical and molecular characterization of the homocysteine s-methyltransferase from broccoli (brassica oleracea var. italica). Phytochemistry. 68:1112-1119.

174. Pineros MA, Cancado GMA, Maron LG, Lyi MS, Menossi M, Kochian LV. 2008. Not all ALMT1-type transporters mediate aluminum-activated organic acid responses: The case of *ZmALMT1*. Plant Journal 53: 352-367.

175. Maron LG, Kirst M, Mao C, Milner MJ, Menossi M and LV. Kochian. 2008. Transcriptional profiling of aluminum toxicity and tolerance responses in maize roots. New Phytologist 179: 116–128.

176. Pineros MA, Cancado GMA, Kochian LV. 2008. Novel properties of the wheat aluminum tolerance organic acid transporter (TaALMT1) revealed by electrophysiological characterization in *Xenopus* oocytes: Functional and structural implications. Plant Physiol 147: 2131-2146.

177. Klein MA, Sekimoto H, Milner MJ and LV Kochian. 2008. Investigation of heavy metal hyperaccumulation at the cellular level: development and characterization of *Thlaspi caerulescens* suspension cell lines. Plant Physiol 147: 2006-2016.

178. Milner MJ, Kochian LV. 2008. Investigating heavy-metal hyperaccumulation using *Thlaspi caerulescens* as a model system. Ann Bot 102: 3-13

179. Sooksanguan T, Yakubov B, Kozlovskyy VI, Barkume CM, Howe KJ, Thannhauser TW, Rutzke MA, Hart JJ, Kochian LV, Rea PA, and OK Vatamaniuk. 2009. *Drosophila* ABC Transporter, DmHMT-1, Confers Tolerance to Cadmium. DmHMT-1 and its yeast homolog, SpHMT-1, are not essential for vacuolar phytochelatin sequestration. J. Biol Chem 284: 354-362.

180. Kochian LV, Hoekenga OA, Magalhaes JV, Pineros MA. 2009. Maize aluminum tolerance. In: *The Maize Handbook - Volume 1: The Biology of Maize* (Bennetsen J, and Hake, S,eds). Springer-Verlag, New York, NY, pp. 367-380.

181. Liu JW, Magalhaes JV, Shaff JE, Kochian LV. 2009. Aluminum-activated citrate and malate transporters from the MATE and ALMT families function independently to confer Arabidopsis aluminum tolerance. Plant Journal 57: 389-399.

182. Ligaba A, Kochian LV, Pineros MA. 2009. Phosphorylation at S384 regulates the activity of the TaALMT1 malate transporter that underlies aluminum resistance in wheat. Plant Journal 60: 411-423.

183. Wang Y-H, Mosebach CM, Kibbey AS, Ryhal MK, Jones AD, Kochian LV. 2009. Generation of Arabidopsis mutants by heterologous expression of a full length cDNA library from tomato fruits. Plant Mol Biol Reporter 27: 454-461.

184. Kuepper H, and LV Kochian. 2010. Transcriptional regulation of metal transport genes and mineral nutrition during acclimation to cadmium and zinc in the Cd/Zn hyperaccumulator, *Thlaspi caerulescens (Ganges population)*. New Phytologist 185: 114-129.

185. Liu JW, Magalhaes JV, Shaff JE, Kochian LV. 2009. Arabidopsis combines the function of aluminum-activated citrate and malate transporters from the MATE and ALMT families in aluminum tolerance. Proceedings of the 7th International Symposium on Plant-Soil Interactions at Low pH, Guangzhou, China, pp. 69-70.

186. Maron LG, Guimaraes CT, Mao C, LV. Kochian 2009. Transcriptional profiling of aluminum toxicity and tolerance responses in maize roots. . Proceedings of the 7th International Symposium on Plant-Soil Interactions at Low pH, Guangzhou, China, 138-139.

187. Kochian LV, Magalhaes JV, Liu J, Hoekenga OA, Pineros MA. 2009. Recent advances on the molecular basis of crop aluminum resistance. Proceedings of the 7th International Symposium on Plant-Soil Interactions at Low pH, Guangzhou, China, pp. 1-2.

188. Hoekenga OA, Buckler ES, Kirst M, Krill AM, Lyi SM, Magalhaes JV, Maron LG, Kochian LV. 2009. Joint linkage-association analysis of aluminium tolerance in maize. Proceedings of the 7th International Symposium on Plant-Soil Interactions at Low pH, Guangzhou, China, pp. 136-137.

189. Pineros MA, Kochian LV. 2009. Overview of the structure-function relations underlying the functionality of ALMT and MATE-type transporters involved in the organic acid release Al tolerance response. Proceedings of the 7th International Symposium on Plant-Soil Interactions at Low pH, Guangzhou, China, pp. 55-56.

190. Ligaba A, Pineros MA, Kochian LV. 2009. Modulation of TaALMT1 transport activity by protein phosphorylation. . Proceedings of the 7th International Symposium on Plant-Soil Interactions at Low pH, Guangzhou, China, pp. 73-74.

191. Shaff JE, Schultz BA, Craft EJ, Clark RT, Kochian LV. 2009.GEOCHEM-EZ: A chemical speciation program with greater power and flexibility. Proceedings of the 7th International Symposium on Plant-Soil Interactions at Low pH, Guangzhou, China, pp. 27-28.

192. Clark, Kochian LV. 2009. Investigating whole root systems: Advances in root quantification tools and techniques. Proceedings of the 7th International Symposium on Plant-Soil Interactions at Low pH, Guangzhou, China, pp. 143-144.

193. Guimaraes CT, Magalhaes JV, Jardim SN, Almeida RV, Maron L, Parentoni SN, Alves VMC, Lana UGP, Gama EEG, Hoekenga O, Paiva E, Kochian LV. 2009. QTL and selection mapping for Al tolerance in tropical maize. Proceedings of the 7th International Symposium on Plant-Soil Interactions at Low pH, Guangzhou, China, pp. 147-148.

194. Koyama H, Iuchi S, Hoekenga O, Kobayashi Y, Sawaki Y, Kobayashi Y, Kochian LV, Kobayashi W. 2009. Signal transduction pathway of the Al responsive malate release in Arabidopsis – Involvement of reversible protein phosphorylation and STOP1 transcription factor. Proceedings of the 7th International Symposium on Plant-Soil Interactions at Low pH, Guangzhou, China, pp. 67-68.

195. Zhou X, Yuan Y, Yang Y, Rutzke M, Thannhauser TW, Kochian LV, Li L. 2009. Involvement of a Broccoli COQ5 Methyltransferase in the Production of Volatile Selenium Compounds. Plant Physiol 151: 528-540.

196. Kochian LV, Magalhaes JV, Liu J, Schaffert RE, Guimarães CT, Alves VMC, Klein PE. The sorghum aluminum tolerance gene, SbMATE. 2009. US Patent # US 7,582, 809 B2. Awarded 9-1-09

196. Maron LG, Piñeros MA, Guimarães CT, Magalhaes JV, Pleiman JF, Mao C, Belicuas SNJ, Kochian LV. 2010. Two functionally distinct members of the MATE (multidrug and toxic compound extrusion) family of transporters potentially underlie two major Al tolerance QTL in maize. Plant Journal (In Press).

197. Shaff JE, Schultz BE, Craft EJ, Clark RT, Kochian LV. 2010. GEOCHEM-EZ: A Chemical Speciation Program with Greater Power and Flexibility. Plant Soil (In Press).

198. Milner MM, Pence NS, Lasat MM, Sieb L, Coughlan S, Kochian LV. 2010. Comparative root transcriptomics identifies two nuclear transcriptions factors which play a role in the regulation of plant zinc transport and homeostasis. Plant Journal (under review).