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Education

- Ph.D., 1985: Soil Microbiology (Dept. of Soil Science), North Carolina State University, Raleigh
Dissertation: "The *Glycine max* - *Bradyrhizobium japonicum* symbiosis as affected by associated rhizosphere bacteria"
- M.S., 1982: Soil Microbiology (Dept. of Forestry), North Carolina State University, Raleigh
Thesis: "Temperature and desiccation tolerance of *Rhizobium trifolii*"
- B.S., 1979: Forest Science (Soil Science), Humboldt State University, Arcata, California

Professional Experience

- 1999 Professor – Dept of Plant and Soil Sciences, Univ of Delaware
1992 Associate Professor – Dept of Plant and Soil Sciences, Univ of Delaware
1986 Assistant Professor – Dept of Plant and Soil Sciences, Univ of Delaware
1985 Research Associate (Postdoc, Soil Microbiology),
Dept of Soil Science, North Carolina State University, Raleigh.

Professional Society Memberships

American Society for Microbiology
American Society for the Advancement of Science
Soil Science Society of America

Teaching Contributions

PLSC 170 Soils and Sustainability (annually, Spring)
PLSC 204 Introduction to Soil Science (annually; classroom Fall every year; online Winter)
PLSC 205 Introduction to Soil Science Laboratory (annually in the Fall)
PLSC 419/619 Soil Microbiology (lecture/lab course; every other year Spring)
Nominated for University Excellence in Teaching Award (twice, most recently 2017)
Textbook: Principles and Applications of Soil Microbiology (see publications)

Publications

Books and Chapters

1. Fuhrmann, J.J. 1993. Population diversity groupings of soybean bradyrhizobia. *Adv. Agron.* 50:67-105.
2. Fuhrmann, J.J. 1994. Isolation of soil microorganisms producing antibiotic compounds. pp. 379-405. IN: R. W. Weaver et al. (eds.), *Methods of Soil Analysis, Part 2, Microbiological and Biochemical Properties*. Soil Science Society of America, Madison, Wisconsin.
3. Fuhrmann, J.J. 2021. Microbial metabolism. In: T.G. Gentry, J.J. Fuhrmann, D.A. Zuberer (ed.), *Principles and applications of soil microbiology*. pp. 57-87. 3rd. Ed. Elsevier, Netherlands. (textbook chapter)
4. Fuhrmann, J.J., and D.A. Zuberer. 2021. Carbon transformations and soil organic matter formation. In: T.G. Gentry, J.J. Fuhrmann, D.A. Zuberer (ed.), *Principles and applications of soil microbiology*. pp. 327-361. 3rd. Ed. Elsevier, Netherlands. (textbook chapter)
5. Gentry, T.J., J.J. Fuhrmann, and D.A. Zuberer (eds). 2021. *Principles and applications of soil microbiology*.

3rd. Ed. Elsevier, Netherlands. (textbook)

6. Johnson, R.M., and J.J. Fuhrmann. 1993. Degradation of atrazine and metolachlor in subsoils from an Atlantic Coastal Plain watershed. Soil Sci. Soc. Am. Spec. Publ. No. 32. pp. 27-31. Soil Sci. Soc. Am., Am. Soc. Agron., Madison, Wisconsin.
7. van Berkum, P., Fuhrmann, J.J., and Eardly, B.D. 2000. Phylogeny of rhizobia. In: Nitrogen fixation: from molecules to crop productivity. Eds. F.O. Pedrosa, M. Hungria, G. Yates, and W.E. Newton. Kluwer Academic Publishers, Dordrecht. pp. 165-169.
8. Vasilas, B.L., M. Rabenhorst, J. Fuhrmann, A. Chirnside, and S. Inamdar. 2013. Wetland Biogeochemistry Techniques, pp. 55-420. In: Wetland Techniques, vol 1, Foundations. Eds. J.T. Anderson and C.A. Davis. Springer.

Journal Articles (in print, refereed)

1. Cattelan, A.J., P.G. Hartel, and J.J. Fuhrmann 1998. Bacterial composition in the rhizosphere of nodulating and non-nodulating soybean. Soil Sci. Soc. Am. J. 62:1549-1555.
2. Cattelan, A.J., P.G. Hartel, and J.J. Fuhrmann. 1999. Screening of plant growth promoting rhizobacteria (PGPR) to promote early soybean growth. Soil Sci. Soc. Am. J. 63:1670-1680
3. Cha, D.K., J.J. Fuhrmann, D.W. Kim, and C.M. Golt. 1999. Fatty acid methyl ester (FAME) technology for monitoring *Nocardia* levels in activated sludge. Water Res. 33:1964-1966.
4. Chen J, Li S, Liang C, Xu Q, Li Y, Qin H, Fuhrmann JJ. 2017. Response of microbial community structure and function to short-term biochar amendment in an intensively managed bamboo (*Phyllostachys praecox*) plantation soil: Effect of particle size and addition rate. Sci Total Environ 574:24-33.
5. DeLong, J.P., M.A. Al-Sammak, Z.T. Al-Ameeli, D.D. Dunigan, K.F. Edwards, J.J. Fuhrmann, J.P. Gleghorn, H. Li, K. Haramoto, A.O. Harrison, M.F. Marston, R.M. Moore, S.W. Polson, B.D. Ferrell, M.E. Salsbery, C.R. Schvarcz, J. Shirazi, G.F. Steward, J.L. Van Etten, and K.E. Wommack. 2021. Toward an integrative view of virus phenotypes. Nature Reviews Microbiology. <https://doi.org/10.1038/s41579-021-00612-w>
6. Entry, J.A., J.J. Fuhrmann, R.E. Sojka, and G.E. Shewmaker. 2004. Influence of irrigated agriculture on soil carbon and microbial community structure. Environ. Manage. 33:S363-S373.
7. Entry, J.A., R.K. Hubbard, J.E. Thies, and J.J. Fuhrmann. 2000. The influence of vegetation in riparian filterstrips on coliform bacteria. I. Movement and survival in water. J. Environ. Qual. 29:1206-1214.
8. Entry, J.A., R.K. Hubbard, J.E. Thies, and J.J. Fuhrmann. 2000. The influence of vegetation in riparian filterstrips on coliform bacteria. II. Survival in soils. J. Environ. Qual. 29:1215-1224.
9. Fang, C., M. Radosevich, J.J. Fuhrmann. 2001. Atrazine and phenanthrene degradation in grass rhizosphere soil. Soil Biol. Biochem. 33:671-678.
10. Fang, C., M. Radosevich, J.J. Fuhrmann. 2001. Characterization of rhizosphere microbial community structure in five similar grass species using FAME and BIOLOG analyses. Soil Biol. Biochem. 33:679-682.
11. Franklin, S., A. Kravchenko, R. Vargas, B. Vasilas, J. Fuhrmann, and Y. Jin. 2021. The unexplored role of preferential flow in soil carbon dynamics. <https://doi.org/10.1016/j.soilbio.2021.108398>
12. Franzluebbers, A.J., N. Nazih, J.A. Stuedemann, J.J. Fuhrmann, H.H. Schomberg, P.G. Hartel. 1999. Soil carbon and nitrogen pools under low- and high-endophyte-infected tall fescue. Soil Sci. Soc. Am. J. 63:1687-1694.
13. Fuhrmann, J. 1989. Serological distribution of *Bradyrhizobium japonicum* as influenced by soybean cultivar and sampling location. Soil Biol. Biochem. 21:1079-1081.
14. Fuhrmann, J. 1990. Symbiotic effectiveness of indigenous soybean bradyrhizobia as related to serological, morphological, rhizobitoxine, and hydrogenase phenotypes. Appl. Environ. Microbiol. 56:224-229.
15. Fuhrmann, J. J. 1991. Purification of siderophores from cultures of fluorescent *Pseudomonas* spp. by ion-exchange chromatography. Soil Biol. Biochem. 23:1111-1113.

16. Fuhrmann, J. J., and B. L. Vasilas. 1993. Field response of the *Glycine-Bradyrhizobium* symbiosis to modified early-nodule occupancy. *Soil Biol. Biochem.* 25:1203-1209.
17. Fuhrmann, J. J., and B. L. Vasilas. 1994. Identification of soybean cultivars tolerant to nodulation by rhizobitoxine-producing bradyrhizobia. *Agron. J.* 86:294-298.
18. Fuhrmann, J., and A. G. Wollum, II. 1985. Simplified enzyme-linked immunosorbent assay for routine identification of *Rhizobium japonicum* antigens. *Appl. Environ. Microbiol.* 49:1010-1013.
19. Fuhrmann, J., and A.G. Wollum, II. 1989. *In vitro* growth responses of *Bradyrhizobium japonicum* to soybean rhizosphere bacteria. *Soil Biol. Biochem.* 21:131-135.
20. Fuhrmann, J., and A.G. Wollum, II. 1989. Nodulation competition among *Bradyrhizobium japonicum* strains as influenced by rhizosphere bacteria and iron availability. *Biol. Fert. Soils* 7:108-112.
21. Fuhrmann, J., and A.G. Wollum, II. 1989. Symbiotic interactions between soybean and competing strains of *Bradyrhizobium japonicum*. *Plant Soil* 119:139-145.
22. Fuhrmann, J., C.B. Davey, and A.G. Wollum, II. 1986. Desiccation tolerance of clover rhizobia in sterile soils. *Soil Sci. Soc. Am. J.* 50:639-644.
23. Fuhrmann, J.J., and B.L. Vasilas. 1991. Transplantation as a soybean field technique to modify root nodule occupancy. *Agron. J.* 83:649-651.
24. Fuhrmann, J.J., and B.L. Vasilas. 1993. Field response of the *Glycine-Bradyrhizobium* symbiosis to modified early-nodule occupancy. *Soil Biol. Biochem.* 25:1203-1209.
25. Fuhrmann, J.J., and B.L. Vasilas. 1994. Variability among soybean cultivars in response to nodulation by a rhizobitoxine-producing strain of bradyrhizobia. *Agron. J.* 86:294-298.
26. Hartel, PG; Myoda, SP; Ritter, KJ; Kuntz, RL; Rodgers, K; Entry, JA; Wey, SAV; Schroder, EC; Calle, J; Lacourt, M; Thies, JE; Reilly, JP; Fuhrmann, JJ. 2007. Geographic sharing of ribotype patterns in *Enterococcus faecalis* for bacterial source tracking. *J. Water Health* 5:539-551.
27. Gentry, T.J., D.C. Wolf, C.M. Reynolds, , J.J. Fuhrmann. 2003. Pyrene and phenanthrene influence on soil microbial populations. *Bioremediation J.* 7:53-68.
28. Hartel, P.G., J.J. Fuhrmann, W.F. Johnson, Jr., E.G. Lawrence, C.S. Lopez, M.D. Mullen, H.D. Skipper, T.E. Staley, D.C. Wolf, A.G. Wollum, II, and D.A. Zuberer. 1994. Survival of a lacZY-containing *Pseudomonas putida* strain under stressful abiotic soil conditions. *Soil Sci. Soc. Am. J.* 58:770-776.
29. Joglekar, P., T. Jarvis, K. Haramoto, N. Place, J. Dums, B. Ferrell, J.J. Fuhrmann, S. Polson, and K.E. Wommack. IN PREPARATION. Exploring the spontaneously produced lysogenic phages of soybean bradyrhizobia and its potential to participate in horizontal gene transfer.
30. Joglekar, P., C.P. Mesa, V.A. Richards, S.W. Polson, K.E. Wommack, J.J. Fuhrmann. 2020. Polyphasic analysis reveals correlation between phenotypic and genotypic analysis in soybean bradyrhizobia (*Bradyrhizobium* spp.). *Systematic and Applied Microbiology* <https://doi.org/10.1016/j.syapm.2020.126073>
31. Johnson, R.M., F.T. Halaweish, and J.J. Fuhrmann. 1992. Analysis of atrazine and associated metabolites in soils by reverse-phase high performance thin layer chromatography. *J. Liq. Chromatog.* 15:2941-2957.
32. Liu, C., L. Cao, H. Qin, C. Liang, Q.-F. Xu, and J.J. Fuhrmann. 2020. Effect of 20 years of mineral and organic fertilization on CO₂ and N₂ fixation bacteria in Moso bamboo plantation in southern China. *Authorea* DOI: 10.22541/au.158981700.09302764
33. Liu, C., Y. Zhou, H. Qin, C. Liang, S. Shao, J.J. Fuhrmann, J. Chen, Q. Xu. 2021. Moso bamboo invasion has contrasting effects on soil bacterial and fungal abundances, co-occurrence networks and their associations with enzyme activities in three broadleaved forests across subtropical China. *Forest Ecology Management* 498 <https://doi.org/10.1016/j.foreco.2021.119549>
34. McCardell, A., and J.J. Fuhrmann. 1992. Determination of persulfate oxidizable carbon by gas chromatography. *Soil Biol. Biochem.* 24:615-616.
35. Myoda, S.P., C.A. Carson, J.J. Fuhrmann, B.-K. Hahm, P.G. Hartel, H. Yampara-Iquise, L. Johnson, R.L. Kuntz, C.H. Nakatsu, M.J. Sadowsky, and M. Samadpour. 2004. Comparison of genotypic-based microbial source tracking methods requiring a host origin database. *J. Water Health* 1:167-180.

36. Nazih, N., A.J. Franzluebbers, P.G. Hartel, and J.J. Fuhrmann. 1998. Diversity of soil microbial populations in the rhizosphere of *Festuca arundinacea* infected or not with *Neotyphodium coenophialum*. (In French) Res. Proc. Internat. Ctr. Adv. Study Mediterranean Agric., April 16-18, 1998, El Jadida, Morocco.
37. Nazih, N., O. Finlay-Moore, P.G. Hartel, and J.J. Fuhrmann. 2001. Whole soil fatty acid methyl ester (FAME) profiles of early soybean rhizosphere as affected by temperature and matric water potential. Soil Biol. Biochem. 33:693-696.
38. Oka, N., P.G. Hartel, O. Finlay Moore, J. Gagliardi, D.A. Zuberer, J.J. Fuhrmann, J.S. Angle, and H.D. Skipper. 2000. Misidentification of soil bacteria by fatty acid methyl ester (FAME) and BIOLOG analyses. Biol. Fert. Soils 32:256-258.
39. Oka, N., P.G. Hartel, and J.J. Fuhrmann. 1997. Effect of plant genotype on rhizobacterial composition of *Arabidopsis thaliana*. p 437-439 In: A. Ogoshi et al. (ed.), Plant growth-promoting rhizobacteria C Present status and future prospects. Proc. of the 4th International Workshop on Plant Growth-Promoting Rhizobacteria, Sapporo, Japan.
40. Olexa, T.J., T.J. Gentry, P.G. Hartel, D.C. Wolf, J.J. Fuhrmann, and C.M. Reynolds. 2000. Mycorrhizal colonization and microbial community structure in the rhizosphere of annual ryegrass grown in pyrene-amended soils. Int. J. Phytorem. 2:213-231.
41. Qin H, Niu L, Wu Q, Chen J, Li Y, Liang C, Xu Q, Fuhrmann JJ, Shen Y. 2017. Bamboo forest expansion increases soil organic carbon through its effect on soil arbuscular mycorrhizal fungal community and abundance. Plant and Soil 420:407-421.
42. Rhine, E.D., J.J. Fuhrmann and M. Radosevich, 2003. Microbial community responses to atrazine exposure and nutrient availability: linking degradation capacity to community structure. Microb. Ecol. 46 :145-160
43. Schutter, M.E., and J.J. Fuhrmann. 1999. Microbial responses to coal fly ash under field conditions. J. Environ. Qual. 28:648-652
44. Schutter, M.E., and J.J. Fuhrmann. 2001. Soil microbial community responses to fly ash amendment as revealed by analyses of whole soils and bacterial isolates. Soil Biol. Biochem. 33:1947-1958
45. Sojka, R.E., J.A. Entry, and J.J. Fuhrmann. 2006. The influence of high application rates of polyacrylamide on microbial metabolic potential in an agricultural soil. Appl. Soil Ecol. 24:243-252.
46. Srinivasiah, S, J. Lovett, S. Polson, J. Bhavsar, D. Ghosh, K. Roy, J.J. Fuhrmann, M. Radosevich, K.E. Wommack. 2013. Direct Assessment of Viral Diversity in Soils by Random PCR Amplification of Polymorphic DNA. Appl. Environ. Microbiol. 79:5450-5457.
47. Srinivasiah, S., Lovett, J., Ghosh, D., Roy, K., Fuhrmann, J., Radosevich, M., and Wommack, K.E. 2015. Dynamics of autochthonous soil viral communities parallels dynamics of host communities under nutrient stimulation. FEMS Microbiol. Ecol. 91 (doi: 10.1093/femsec/fiv063)
48. Teaney, G. B., III, and J. J. Fuhrmann. 1993. Soybean response to nodulation by rhizobitoxine-producing bradyrhizobia as influenced by nitrate application. Plant Soil 154:219-225.
49. Teaney, G.B., III, and J.J. Fuhrmann. 1992. Soybean response to nodulation by bradyrhizobia differing in rhizobitoxine production. Plant Soil 145:275-285.
50. Teng, J., Xiang, T., Huang, Z., Wu, J., Jiang, P., Meng, C., Li, Y., and Fuhrmann, J.J. 2016. Spatial distribution and variability of carbon storage in different sympodial bamboo species in China. J. Environ. Man. 168:46-52.
51. van Berkum, P., and J.J. Fuhrmann. 2001. Characteristics of soybean bradyrhizobia for which serogroup affinities have not been identified. Can. J. Microbiol. 47:519-525.
52. van Berkum, P., J. J. Fuhrmann. 2000. Evolutionary relationships among the soybean bradyrhizobia reconstructed from 16S rRNA gene and Internally Transcribed Spacer region sequence divergence. Int. J. Syst. Evol. Microbiol. 50:2165-2172.
53. van Berkum, P., J. J. Fuhrmann. 2009. Evidence from internally transcribed spacer sequence analysis of soybean strains that extant *Bradyrhizobium* spp. are likely the products of reticulate evolutionary events. Appl. Environ. Microbiol. 75:78-82.
54. Vasilas, B. L., and J. J. Fuhrmann. 1993. Field response of soybean to nodulation by a rhizobitoxine-

- producing strain of *Bradyrhizobium*. *Agron. J.* 85:302-305.
55. Vasilas, B. L., and J. J. Fuhrmann. 1993. Field response of soybean to increased N₂ fixation. *Crop Sci.* 33:785-788.
 56. Vasilas, B., L. Vasilas, J. Thompson, A. Rizzo, J. Fuhrmann, T. Evans, J. Pesek, and K. Kunkle. 2004. Ectomycorrhizal mantles as indicators of hydrology for jurisdictional wetland determinations. *Wetlands* 24: 784-795.
 57. Vasilas, B.L., J. Fuhrmann, and L.E. Gray. 1989. Response of soybeans to lower canopy defoliation during seedfill. *Can. J. Plant Sci.* 69:17-22.
 58. Vasilas, B.L., J.J. Fuhrmann, and R.W. Taylor. 1991. Response of three corn hybrids to defoliation of neighboring plants. *Can. J. Plant Sci.* 71:311-315.
 59. Vasilas, B.L., R.L. Nelson, J.J. Fuhrmann, and T.A. Evans. 1995. Relationship of nitrogen utilization patterns with soybean yield and seed-fill period. *Crop Sci.* 35:809-813.
 60. Williamson, K.W., J.J. Fuhrmann, K.E. Wommack, M. Radosevich. 2017. Viruses in soil ecosystems: an unknown quantity within an unexplored territory. *Annual Review of Virology* 4:16.1–16.19.
 61. Xiong, K., and J.J. Fuhrmann. 1996. Comparison of rhizobitoxine-induced inhibition of β-cystathionase from different bradyrhizobia and soybean genotypes. *Plant Soil* 186:53-61.
 62. Xiong, K., and J.J. Fuhrmann. 1996. Soybean response to nodulation by wild-type and an isogenic *Bradyrhizobium elkanii* mutant lacking rhizobitoxine production. *Crop Sci.* 36:1267-1271.
 63. Xu, Qiu-Fang, Pei-Kun Jiang, Jia-Sen Wu, Guo-Mo Zhou, Ren-Fang Shen, J.J. Fuhrmann. 2015. Bamboo invasion of native broadleaf forest modified soil microbial communities and diversity. *Biol. Invasions* 17:433–444.
 64. Xu, Q.-F., C.-F. Liang, J.-H. Chen, Y.-C. Li, H. Qin, and J.J. Fuhrmann. 2020. Rapid bamboo invasion (expansion) and its effects on biodiversity and soil processes. *Global Ecology and Conservation* 21, e00787, <https://doi.org/10.1016/j.gecco.2019.e00787>.