COMPLETE CIRRICULUM VITAE

Name
Gary E. Harman

Academic Training
Ph. D. Plant Pathology, Oregon State University, 1970
B.S. Botany, Colorado State University, 1966

Professional Experience
Cofounder and Chief Scientific Officer, Phytobials, LLC
Cofounder and Chief Scientific Officer, Biomarinex
CoFounder, former VP and Acting CEO, BioWorks, Inc.
Professor, joint appointment, Department of Horticultural Sciences and Department of Plant Pathology, New York State Agricultural Experiment Station, Cornell University, 1989-present.
Professor, Department of Horticultural Sciences, New York State Agricultural Experiment Station, Cornell University, 1984-present
Chairman, Department of Horticultural Sciences, New York State Agricultural Experiment Station, Cornell University, 1984-1985
Acting Chairman Department of Seed and Vegetable Sciences and Department of Pomology and Viticulture, New York State Agricultural Experiment Station, Cornell University, 1983
Acting Chairman, Department of Seed and Vegetable Sciences, New York State Agricultural Experiment Station, Cornell University, 1981
Associate Professor, New York State Agricultural Experiment Station, Cornell University, 1976-1983
Assistant Professor, New York State Agricultural Experiment Station, Cornell University, 1970-1976
Research Associate, North Carolina State University, 1969-1970

Entrepreneurial Roles

BioWorks, Inc., Geneva, NY markets biological products for control of plant diseases and increased plant productivity.

- Co-principal inventor.
- Consultant in development of proprietary technology.
- Cofounder.
- Various management roles including Acting CEO.

Phytobials, LLC and LTD; sister companies in the US and Europe that intend to become global providers of unique, low cost, and green microbial-plant remediation systems.

- Co-principal inventor
- Cofounder, with responsibilities for securing funding, arranging for collaborations with other academic and corporate partners and providing major input into company structure and the business plan.

Advanced Biological Marketing, a company that markets and produces microbial products for the row crop (e.g., maize and soybeans) market.

- Inventor of key technologies
- Consultant

Biomarinex, a company that is seeking to market N-acetylglucosamine as a nutriceutical.

- Co-principal inventor
- Co-developer of scale-up systems and funding opportunities.

Current Cornell Assignments
Provost's Life Sciences Advisory Council

Facilitator, Genomics in Geneva Group
Evaluation Committee, Life Sciences Technology
Scientific Advisory Board, Cornell Biotechnology Program

Sabbatic Leaves
1979-80: Colorado State University
1991: Agricultural University of Norway

Professional Societies and Duties
American Phytopathological Society
American Association for the Advancement of Science
Editorial Board, Plant Varieties and Seeds

Honors and Awards
Fellow, American Phytopathological Society, Award of Merit in Plant Pathology, American Phytopathological Society, NE Div.; Visiting Professor, Colorado State University; Visiting Professor, Agricultural University of Norway.

Responsibilities
Research (100%)

Graduate student advisees
Marc Blume, MS, SUNY Coll. Environ. Sci & Forestry, Syracuse, 1978
Ellen M. Chirco, MS, Seed Science, Cornell, 1979
Judith A. Hough, PhD, Entomology, Cornell, 1981 (C. Eckenrode co-advisor)
Chaur Tseun Lo, PhD, Plant Pathology, Cornell, 1997
Joyathi Bolar, PhD Plant Pathology, 2000.
Thomas E. Stasz, PhD, Plant Pathology, Cornell, 1979
Akrofi Djietror, MS, Seed Science, Cornell, 1982
Judith S. Hall, PhD, Vegetable Crops, Cornell, 1990

Postdoctoral and research associates
Jonathan P. Hubbard, 1979-80
Wei-Lang Chao 1983-84
Thomas E. Stasz 1985-88
Tai-Gi Min 1988-89
Christopher K. Hayes, 1989-1995
Shipeng Deng, 1996-97
Izhak Hadar, 1980-81
Eric B. Nelson 1984-85
Alex Sivan 1987-88
Xixuan Jin 1989-90
Weikuan Gu 1995-96
Bruno Donzelli, 1997-2001

Visiting scientists
Alison A. Powell, University of Aberdeen, Scotland, 1982
Giovanni Vannacci, Univeristy of Pisa, Italy, 1985
Ilan Chet, Hebrew University of Jerusalem, Israel, 1989
Antonio Di Pietro, University of Basel, Switzerland, 1991-92
Matteo Lorito, University of Naples, Italy, 1991-1993
Lis Jensen, Royal Veterinary and Agricultural University, Denmark, 1992
James P. Nakas, SUNY College of Environmental Science and Forestry, Syracuse, 1993
Henk Satter, Incotec, Enhuizen, Holland, 1994
S-K Park, National Univ., Chonnam, South Korea, 1996-97
Manuel Montero, University of Salamanca, Spain, 1999
Richard J. Gorecki, Univ. of Agric. and Technol., Olsztyn, Poland, 1983
M. Lodovica Gullino, University of Torino, Italy, 1987-88
Arne Tronsmo, Agricultural University of Norway, 1989-90
Emma Penny, University of Aberdeen, Scotland, 1992
Helle Haugaard, Royal Veterinary and Agricultural University, Denmark, 1992
Clemens Peterbauer, Technical University of Vienna, Austria, 1992
Nicoletta Pucci, University of Pisa, Italy, 1993
Claudio Altomare, CNR, Bari, Italy 1995-96
Antonio Llobell, University of Sevilla, Spain, 1998-99
Tong Xu, Zhejiang Agricutural University, PRC, 1997

Chen Jie, Shenyang Agricultural University, PRC, 2001, 2002

Leobardo Serrano-Carreon
Instituto de Biotechologia
Universidad Nacional Autonoma de Mexico
Cuernaca, Morelos, Mexico

Bhuddhi Khadge, Nepal, 2001.

LIST OF PUBLICATIONS

Ph.D. **Thesis**:

Harman, G. E. 1970. Purification and properties of the polygalacturonases produced by Fusarium oxysporum f. sp. lycopersici. Oregon State University.

Books

Kubicek, C. P. and Harman, G. E. 1998. *Trichoderma and Gliocladium, Basic Biology, Taxonomy and Genetics*, Vol. 1. Taylor & Francis, London 278 pg.

Harman, G. E. and Kubicek, C. P. 1998. *Trichoderma and Gliocladium, Enzymes, Biological Control and Commercial Applications*, Vol. 2. Taylor & Francis, London 393 pg.

Vurro, M., Gressel, J., Butt, T., Haman, G. E.,.Pilgeram, A., St. Ledger, R. J. and Nuss, D. L. 2001. *Enhancing Biocontrol Agents and Handling Risks*. IOS Press, Amsterdam. 295 pg.

Refereed Journals:

1. Harman, G. E. 1967. Physiology of sexual reproduction in Hypomyces solani f. cucurbitae. III. Perithecium formation on media containing compounds involved in shikimic acid pathway. Phytopathology 57: 1138-1139.
2. Harman, G. E., G. V. Gooding Jr. and T. T. Herbert. 1970. Effect of tobacco mosaic virus infection on some chemical constituents of flue-cured tobacco. Tobacco Science 138: 29-31.
3. Harman, G. E., C. E. Heit, and S. W. Braverman. 1971. Seedborne fungi of fresh Antirrhinum majus seed. Plant Disease Reporter 55: 639-642.
4. Harman, G. E., A. A. Khan, and R. E. Drury. 1971. Morphactin influences sexual and asexual reproduction in fungi. Canadian Journal of Microbiology 17: 1477-1479.
5. Harman, G. E., G. V. Gooding Jr., and T. T. Herbert. 1971. The state and infectivity of tobacco mosaic virus in flue-cured tobacco tissue. Phytopathology 61: 1032-1033.
6. Harman, G. E. 1972. Deterioration of stored pea seed by Aspergillus ruber: Extraction and properties of a toxin. Phytopathology 62: 206-208.
7. Harman, G. E., and G. Nash. 1972. Deterioration of stored pea seed by Aspergillus ruber: Evidence for involvement of a toxin. Phytopathology 62: 209-212.
8. Harman, G. E., and M. E. Corden. 1972. Purification and partial characterization of the polygalacturonases produced by Fusarium oxysporum f. sp. lycopersici. Biochimica et Biophysica Acta 264: 328-338.
9. Harman, G. E., and A. L. Granett. 1972. Deterioration of stored pea seed: Changes in germination, membrane permeability and ultrastructure resulting from infection by Aspergillus ruber and from aging. Physiological Plant Pathology 2: 271-278.
10. Harman, G. E. 1973. Deterioration of stored pea seed by Aspergillus ruber: Partial purification and characterization of a toxin to peas. Phytopathology 63: 46-49.
11. Harman, G. E., and R. E. Drury. 1973. Respiration of pea seeds (Pisum sativum) infected with Aspergillus ruber. Phytopathology 63: 1040-1044.
12. Harman, G. E., C. E. Heit, F. L. Pflger, and S. W. Braverman. 1973. Snapdragon seed blight - a serious problem caused by seedborne fungi. Plant Disease Reporter. 57: 592-595.
13. Harman, G. E., F. L. Pfleger, and S. W. Braverman. 1973. Growth of Puccinia antirrhini in imbibed snapdragon seeds. Plant Disease Reporter. 57: 709-710.
14. Harman, G. E., and F. L. Pfleger. 1974. Pathogenicity and infection sites of Aspergillus species in stored seeds. Phytopathology 64: 1139-1144.
15. Nittler, L. W., G. E. Harman, and B. Nelson. 1974. Hila discoloration in Traverse soybean seeds: A problem in cultivar purity analysis and a possible indication of low quality seeds. Proceedings of the American Association of Seed Analysts of North America 64: 115-119.
16. Pfleger, F. L., G. E. Harman, and G. A. Marx. 1974. Bacterial blight of carrots: Interaction of temperature, light, and inoculation procedures on disease development of various carrot cultivars. Phytopathology 64: 746- 749.
17. Tao, K. L., A. A. Khan, G. E. Harman, and C. J. Eckenrode. 1974. Practical significance of the application of chemicals in organic solvents to dry seeds. Journal of the American Society of Horticultural Science 99: 217-220.
18. Eckenrode, C. J., G. E. Harman, and D. R. Webb. 1975. Seed-borne microorganisms stimulate seedcorn maggot egg laying. Nature 256: 487-488.
19. Pfleger, F. L., and G. E. Harman. 1975. Fungal antisporulant activity of a complex lipid fraction from pea seeds. Canadian Journal of Botany 53: 1625-1629.
20. Pfleger, F. L., and G. E. Harman. 1975. Inability of storage fungi to invade pea embryos: Evidence against phytoalexin involvement. Phytopathology 65: 642-643.

21. Harman, G. E., A. A. Khan, and K. T. Tao. 1976. Physiological changes in the early stages of germination of pea seeds induced by aging and by a storage fungus, Aspergillus ruber. Canadian Journal of Botany 54: 39-44.
22. Harman, G. E., and L. R. Mattick. 1976. Association of lipid oxidation with seed aging and death. Nature 260: 323-324.
23. Harman, G. E., S. W. Braverman, and E. C. Waters. 1977. Pythium aphanidermatum seedborne on squash. Journal of Seed Technolology 1: 55-59.
24. Harman, G. E., C. J. Eckenrode, and D. R. Webb. 1978. Alteration of spermosphere ecosystems affecting oviposition by the bean seed fly and attack by soilborne fungi on germinating seeds. Annals of Applied Biology 90:1-6.
25. Harman, G. E. and G. Nash. 1978. Soaking Brassica seeds in fungicide solutions to eradicate seedborne fungi: A comparison of aqueous and organic solvent infusion techniques. Plant Disease Reporter 62:408-412.
26. Harman, G. E., B. Nedrow, and G. Nash. 1978. Stimulation of fungal spore germination by volatiles from aged seeds. Canadian Journal of Botany 56:2124-2127.
27. Blume, M. C. and G. E. Harman. 1979. Thielaviopsis basicola: A component of the pea root rot complex in New York State. Phytopathology 69:785-788.
28. Chirco, E. M. and G. E. Harman. 1979. The effects of Alternaria brassiciola infection on Brassica seed vigor and viability. Journal of Seed Technology 3:12-22.
29. Ellis, R. R., C. J. Eckenrode, and G. E. Harman. 1979. Influence of onion cultivars and their microbial colonizers on resistance to onion maggot. Economic Entomology 72:512-515.
30. Harman, G. E., I. Chet, and R. Baker. 1980. Trichoderma hamatum effects on seed and seedling disease induced in radish and pea by Pythium spp. on Rhizoctonia solani. Phytopathology 70:1167-1172.
31. Harman, G. E., L. R. Mattick, G. Nash, and B. L. Nedrow. 1980. Stimulation of fungal spore germination and inhibition of sporulation in fungal vegetative thalli by fatty acids and their volatile peroxidation products. Canadian Journal of Botany 14:1541-1547.
32. Humayadan, H. S., G. E. Harman, B. S. Nedrow, and L. V. DiNitto. 1980. Eradication of Xanthomonas campestris, the causal agent of black rot, from Brassica seeds by antibiotic/NaOCl soak treatments. Phytopathology 70:127- 131.
33. Nedrow, B. L. and G. E. Harman. 1980. Salvage of New York soybean seeds following an epiphytotic of seedborne pathogens associated with delayed harvest. Plant Disease 64:696-698.
34. Stasz, T. E. and G. E. Harman. 1980. Interaction of Pythium ultimum with resistant or susceptible pea (Pisum sativum) seeds. Phytopathology 70:27- 31.
35. Stasz, T. E., G. E. Harman, and G. A. Marx. 1980. Time and site of infection of resistant and susceptible germinating pea seeds by Pythium ultimum. Phytopathology 70:730-733.
36. Chet, I., G. E. Harman, and R. Baker. 1981. Trichoderma hamatum: Its hyphal interactions with Rhizoctonia solani and Pythium spp. Microbial Ecology 7:29-38.
37. Harman, G. E., I. Chet, and R. Baker. 1981. Factors affecting Trichoderma hamatum applied to seeds as a biocontrol agent. Phytopathology 71:569-572.
38. Hough, J. A., G. E. Harman, and C. J. Eckenrode. 1981. Microbial stimulation of onion maggot oviposition. Environmental Entomology 10:206-210.
39. Harman, G. E., B. L. Nedrow, B. E. Clark, and L. R. Mattick. 1982. Association of volatile aldehyde production during germination with poor soybean and pea seed quality. Crop Science 22:712-716.
40. Hough, J. A., C. J. Eckenrode, and G. E. Harman. 1982. Non-pathogenic bacteria affecting oviposition behavior in the onion fly. Environmental Entomology 72:512-515.
41. Hubbard, J. P., G. E. Harman, and C. J. Eckenrode. 1982. Interaction of a biological control agent, Chaetomium globosum, with seed coat microflora. Canadian Journal of Microbiology 28:431-437.
42. Hadar, Y., G. E. Harman, A. G. Taylor, and J. M. Norton. 1983. Effects of pregermination of pea and cucumber seeds and of seed treatment with Enterobacter cloacae on rots caused by Pythium spp. Phytopathology 73:1322-1325.
43. Hubbard, J. P. and G. E. Harman. 1983. Effects of soilborne Pseudomonas spp. on the biological control agent, Trichoderma hamatum on pea seeds. Phytopathology 73:655-659.
44. Ruppel, E. G., R. Baker, G. E. Harman, J. P. Hubbard, R. J. Hecker, and I. Chet. 1983. Field trials of Trichoderma harzianum as a biocontrol agent of seedling disease in several crops and Rhizoctonia root rot of sugar beet. Crop Protection 2:399-408.
45. Hadar, Y., G. E. Harman, and A. G. Taylor, 1984. Evaluation of Trichoderma koningii and T. harzianum from New York soils for biological control of seed rot caused by Pythium spp. Phytopathology 74:106-110.
46. Harman, G. E. 1984. Influence of fatty acid peroxidation in seeds on seed quality and performance. Search 4:1-4.

47. Taylor, A. G., Y. Hadar, J. M. Norton, A. A. Khan, and G. E. Harman. 1985. Influence of presowing seed treatments of table beet on the susceptibility to damping-off caused by Pythium spp. Journal of the American Society of Horticultural Sciences 110:516-519.
48. Norton, J. M. and G. E. Harman. 1985. Responses of soil microorganisms to volatile exudates from germinating pea seeds. Canadian Journal of Botany 63:1040-1045.
49. Gorecki, G. E. Harman, and L. R. Mattick. 1985. The volatile exudates from germinating pea seeds of different viability and vigor. Canadian Journal of Botany 63:1035-1039.
50. Chao, W. L., E. B. Nelson, G. E. Harman, and H. C. Hoch. 1986. Colonization of the rhizosphere by biological control agents applied to seeds. Phytopathology 76:60-65.
51. Nelson, E. B., W. L. Chao, J. M. Norton, G. T. Nash, and G. E. Harman. 1986. Attachment of Enterobacter cloacae to hyphae of Pythium ultimum. Possible role in the biological control of Pythium damping-off. Phytopathology 76:327-335.
52. Powell, A. A. and G. E. Harman. 1986. Absence of a consistent association of changes in membranal lipids with the ageing of pea seeds. Seed Science and Technology 13:659-667.
53. Gorecki, R. J. and G. E. Harman. 1987. Effects of antioxidants on viability and vigour of ageing pea seeds. Seed Science and Technology 15:109-117.
54. Harman, G. E., J. M. Norton, T. E. Stasz, and H. S. Humaydan. 1986. Eradication or reduction of infection of Xanthomonas campestris pv. campestris, the causal agent of black rot of Brassica spp., using an Alcide(R) seed treatment. Plant Disease 71:27-30.
55. Vannacci, G. and G. E. Harman. 1987. Biocontrol of seedborne Alternaria raphani and A. brassicicola. Canadian Journal of Microbiology 33:850-856.
56. Harman, G. E. and T. E. Stasz. 1988. Fluorescent vital stains for complementary labelling of protoplasts from Trichoderma spp. Stain Technology 63:241-247
57. Harman, G. E. and A. G. Taylor. 1988. Improved seedling performance by integration of biological control agents at favorable pH levels with solid matrix priming. Phytopathology 78:520-525.
58. Nelson, E. B., G. E. Harman, and G. T. Nash. 1988. Enhancement of Trichoderma-induced biological control of Pythium seed rot and pre-emergence damping-off of peas. Soil Biology and Biochemistry 20:145-150.
59. Stasz, T. E., G. E. Harman, and N. F. Weeden. 1988. Protoplast preparation and fusion in two biocontrol strains of Trichoderma harzianum. Mycologia 80:141-150.
60. Stasz, T. E., N. F. Weeden, and G. E. Harman. 1988. Methods of isozyme electrophoresis for Trichoderma and Gliocladium species. Mycologia 80:870-874.
61. Harman, G. E. and T. E. Stasz. 1989. Combining effective strains of Trichoderma harzianum and solid matrix priming to provide improved biological seed treatment systems. Plant Disease 72:631-637.
62. Stasz, T. E., K. Nixon, G. E. Harman, N. F. Weeden, and G. A. Kuter. 1989. Evaluation of species and phytogenetic relationships in the genus Trichoderma by cladistic analysis of isozyme polymorphism. Mycologia 81:391-403
63. Stasz, T.E., G.E. Harman, and M.L. Gullino. 1989. Limited vegetative compatibility following intra- and interspecific protoplast fusion in Trichoderma. Experimental Mycology 13:364-371.
64. Stasz, T. E. and G. E. Harman. 1990. Nonparental progeny resulting from protoplast fusion in Trichoderma in the absence of parasexuality. Experimental Mycology 14:145-159.
65. Smith, V. L., W. F. Wilcox, and G. E. Harman. 1990. Potential for biological control of Phytophthora root and crown rots of apple by Trichoderma and Gliocladium spp. Phytopathology 70:880-885.
66. Sivan, A., G. E. Harman, and T. E. Stasz. 1990. Transfer of isolated nuclei into protoplasts of Trichoderma harzianum. Applied and Environmental Microbiology 56:2404-2409.
67. Sivan, A. and G. E. Harman. 1991. Improved rhizosphere competence in a protoplast fusion progeny of Trichoderma harzianum. Journal of General Microbiology 137:23-29.
68. Harman, G. E., X. Jin, T. E. Stasz, G. Peruzzotti, A. C. Leopold, and A. G. Taylor. 1991. Production of conidial biomass of Trichoderma harzianum for biological control. Biological Control. 1:23-28.
69. Taylor, A. G., T-G Min, G. E. Harman, and X. Jin. 1991. Liquid coating formulation for the application of biological seed treatments of Trichoderma harzianum. Biological Control 1:16-22.
70. Hall, J. and G. E. Harman. 1991 Efficacy of oil treatments of legume seeds for control of Aspergillus and Zabrotes. Crop Protection 10:315-319.
71. Hall, J. and G. E. Harman. 1991. Protection of stored legume seeds against attack by storage fungi and weevils: mechanism of action of lipoidal and oil seed treatments. Crop Protection. 10:375-320.
72. Jin, X., G. E Harman, and A. G. Taylor. 1992. Conidial biomass and desiccation tolerance in Trichoderma harzianum. Biological Control 1:237-243.
73. Sivan, A., T. E. Stasz, M. Hemmat, C. K. Hays, and G. E. Harman. 1992 Transformation of Trichoderma spp. with plasmids conferring hygromycin B resistance. Mycologia 84:687-694.

74. Harman, G. E., C. K. Hayes, M. Lorito, R. M. Broadway, A. DiPietro, C. Peterbauer, and A. Tronsmo. 1993. Chitinolytic enzymes of Trichoderma harzianum: Purification of chitobiosidase and endochitinase. Phytopathology 83:313-318.
75. Lorito, M., G. E. Harman, C. K. Hayes, R. M. Broadway, A. Tronsmo, S. L. Woo, and A. DiPietro. 1993. Chitinolytic enzymes produced by Trichoderma harzianum: Antifungal activity of purified endochitinase and chitobiosidase. Phytopathology 83:302-307.
76. DiPietro, A., M. Lorito, C. K. Hayes, R. M. Broadway, and G. E. Harman. 1993. Endochitinase from *Gliocladium virens*: Isolation, characterization, and synergistic antifungal activity in combination with gliotoxin. Phytopathology 83:308-313.
77. Tronsmo, A. and G. E. Harman. 1993. Detection and quantification of N-acetyl-ß-D-glucosaminidase, chitobiosidase, and endochitinase in solutions and on gels. Anal. Biochem. 208:74-79.
78. Tronsmo, A. and G. E. Harman. 1993. Coproduction of chitinases and biomass for biological control by Trichoderma harzianum on media containing chitin. Biol. Contr. 2:272-277.
79. Hayes, C. K., Harman, G. E., Woo, S. L. and Gullino, M. L. 1993. Methods for electrophoretic karyotyping of filamentous fungi in the genus Trichoderma. Anal. Biochem. 209:176-182.
80. Lorito, M., Hayes, C. K., Di Pietro, A., and Harman, G. E. 1993. Biolistic transformation of Trichoderma harzianum and Gliocladium virens using plasmid and genomic DNA. Curr. Genet. 24:349-356.
81. Lorito, M., Peterbauer, C., Hayes, C. K., and Harman, G. E. 1994. Synergistic interaction between fungal cell wall degrading enzymes and different antifungal compounds enhances inhibition of spore germination. Microbiology 140:623-629.
82. Lorito, M., Hayes, C. K., Woo, S. L. Di Pietro, A., and Harman, G. E. 1993. Antifungal, synergistic interaction between chitinolytic enzymes from Trichoderma harzianum and Enterobacter cloacae. Phytopathology 73:721-728
83. Hayes, C. K., Klemsdal, S., Lorito, M., Di Pietro, A., Peterbauer, C., Nakas, J. P., Tronsmo, A., and Harman, G. E. 1994. Isolation and sequence of an endochitinase gene from a cDNA library of Trichoderma harzianum. Gene 135:143-148.
84. Lorito, M., Hayes, C. K., Di Pietro, A., Woo, S. L., and Harman, G. E. 1994. Purification, characterization, and synergisitic activity of a glucan 1,3-ß-glucosidase and an N-acetyl-ß-glucosaminidase from Trichoderma harzianum. Phytopathology 84: 398-405.
85. Lorito, M., R. M. Broadway, D. Williams, C. K. Hayes, and G. E. Harman. 1994. Proteinase inhibitors as a novel class of fungitoxic compounds. Molec. Plant Microbe Interact. 7:525-527.
86. Schirmböck, M., Lorito, M., Wang, Y-L, Hayes, C. K., Arisan-Atac, I., Scala, F. Harman, G. E., and Kubicek, C. K. Molecular mechanism involved in mycoparasitism by Trichoderma harzianum: co-induction and synergism of hydrolytic enzymes and peptabiol antibiotics. Appl. Environ. Microbiol. 12:4364-4370.
87. Broadway, R. M., Williams, D. L., Kain, W. C., Harman, G. E., Lorito, M., and Labeda, D. P. 1995. Partial characterization of chitinolytic enzymes from Streptomyces albidoflavus. Lett. Appl. Microbiol. 20: 271-276.
88. Lorito, M., D'Ambrosia, M., Woo, S. L., Harman, G. E., Hayes, C. K., and Scala, F. 1996. Synergistic interaction between cell wall-degrading enzymes and membrane-affecting compounds. Molec. Plant Microbe Interact. Plant Microbe Interact. 3:206-213.
89. Klemsdahl, S. S., Hayes, C. K., Hjeljord, L., Harman, G. E., and Tronsmo, A. 1996. Isolation and characterization of of a cDNA from Trichoderma harzianum P1 encoding a 14.3.3 protein homologue. Gene 171:123-127.
90. Harman, G. E., Latorre, B., Agosin, A., San Martin, R., Riegel, D. G., Nielsen, P. A., Tronsmo, A., and Pearson, R. C. 1996. Biological and integrated control of Botrytis bunch rot of grape using Trichoderm*a* spp. Biol. Contr. 7:259-296.
91. Lo, C-T, Nelson, E. B., and Harman, G. E. 1996. Control of turfgrass diseases with a rhizosphere competent strain of *Trichoderma harzianum*. Plant Dis. 80:736-741.
92. Jin, X., Taylor, A. G., and Harman, G. E. 1996. Development of media and automated liquid fermentation methods to produce desiccation-tolerant propagules of Trichoderma harzianum. Biol. Cont. 7:267-274.
93. Margolles-Clark, E., Harman, G. E.,and Pentillä, M. 1996. Enhanced expression of endochitinase in Trichoderma harzianum using the cbh 1 promoter of Trichoderma reesei. Appl. Environ. Microbiol. 62:2152-2155.
94. Margolles-Clark, E., Harman, G. E., Hayes, C. K. and Pentillä, M. 1996. Improved production of Trichoderma harzianum endochitinase by expression in T. reesei. Appl. Environ. Microbiol. 62:2145-2151.
95. Peterbauer, C., Lorito, M., Hayes, C. K., Harman, G. E., and Kubicek, C. K. 1996. Molecular cloning and expression of nag 1 (N-acetyl-ß-D-glucosaminidase-encoding) gene from Trichoderma harzianum P1. Curr. Genet. 30:325-331.

96. Lo, C-T, Nelson, E. B, and Harman, G. E. 1997. Improving the biocontrol efficacy of *Trichoderma harzianum* 1295-22 for controlling foliar phases of turf diseases by spray applications. Plant Dis. 81:1132-1138.
97. Lo, C-T, Nelson, E. B, and Harman, G. E. 1998. Ecological studies of transformed *Trichoderma harzianum* strain 1295-22 in the rhizosphere and on the phylloplane of creeping bentgrass. Phytopathology 88:129-136.
98. Björkman, T., Blanchard, L., and Harman, G. E. 1998. Growth enhancement of shrunken-2 sweet corn by *Trichoderma harzianum* KRL-AG2: Effect of environmental stress. J. Am. Soc. Hort. Sci. .123:35-45.
99. Lorito, M., Woo, S. L., Fernandez, I. G., Colucci, G., Harman, G. E., Pintor-Toro, J. A., Fillipone, E. Muccifora, S., Lawrence, C. B., Zoina, A., Tuzun, S., and Scala, F. 1998. Genes from mycoparasitic fungi as a source for improving plant resistance to fungal pathogens. Proc. Natl. Acad. Sci., USA 95:7860-7865.
100. Woo, S. L., B. Donzelli, B., Scala, F., Mach, R., Harman, G. E., Kubicek ,C. P., Del Sorbo, G., and Lorito, M. 1999. Disruption of *ech42* (endochitinase-encoding) gene affects biocontrol activity in *Trichoderma harzianum* strain P1. Molec. Plant Microbe Interact. 12:419-429.
101. Altomare, C., Norvell, W. A., Björkman, T. and Harman, G. E. 1999. Solubilization of phosphates and micronutrients by the plant-growth promoting and biocontrol fungus *Trichoderma harzianum* Rifai strain 1295-22. Appl. Environ. Microbiol. 65: 2926-2933.
102. Wong, K-W, Harman, G. E., Norelli, J. L., Gustafson, H. L. and Aldwinckle, H. S. 1999.Chitinase-transgenic lines of 'Royal Gala' apple showing enhanced resistance to apple scab. Acta Hort. 484: 595-599.
103. Bolar, J. P., Norelli, J. L., Wong, K-W, Hayes, C. K., Harman, G. E. and Aldwinckle, H. S. 2000. Expression of endochitinase from *Trichoderma harzianum* increases resistance to apple scab and reduces vigor. Phytopathology 90:72-77.
104. Harman, G. E. 2000. The myths and dogmas of biocontrol. Changes in perceptions derived from research on *Trichoderma harzianum* T-22. Plant Disease 84:373-393.
105. Kovach, J., Petzoldt, R and Harman, G. E. 2000. Using honey bees and bumble bees to disseminate *Tirchoderma harzianum* 295-22 to strawberries for *Botyrtis* control. Biol. Contr. 18: 235-242.
106. Donzelli, B. G. G., Lorito, M., Scala, F. and Harman, G. E. 2001. Cloning, sequence and structure of a gene encoding an antifungal glucan 1,3-β-glucosidase from *Trichoderma atroviride* (*T. harzianum*). Gene 277: 199-208.
107. Bolar, J. P., Norelli, J. L., Harman, G. E., Brown, S. K. and Aldwinckle, H. S. 2001. Synergistic activity of endochitinase and exochitinase from *Trichoderma atroviride* (*T. harzianum*) against the pathogenic fungus *Venturia inaequalis* in transgenic apple plants. Transgen. Res. 10:533-543.
108. Donzelli, B. G. G. and Harman, G. E. 2001. Interaction of ammonium, glucose and chitin regulates the expression of cell wall-degrading enzymes in *Trichoderma atrovir*ide strain P1. Appl. Environ. Microbiol. 67:5463-5647.
109. Ali, G. S., Harman, G. E., Reisch, B. I. 2003. The interaction of endochitinase, a synthetic peptide and resveratrol in controlling fungi in vitro. Eur. J. Plant Pathol. 109:639-644.
110. Donzelli, B. D. D., Ostroff, G. and Harman, G. E. 2003. Enhanced enzymatic hydrolysis of langostino shell chitin with mixtures of enzymes from bacterial and fungal sources. Carboh. Res. 338: 1823-1833.
111. Harman, G. E., Petzoldt, R., Comis, A., Chen, J. 2004. Interactions between *Trichoderma harzianum* strain T22 and maize inbred line Mo17 and effects of this interaction on diseases caused by *Pythium ultimum* and *Colletotrichum graminicola*. Phytopathology 94:147-153.
112. Harman, G. E., Howell, C. R., Viterbo, A., Chet, I., Lorito, M. 2004. *Trichoderma* spp.—opportunistic avirulent plant symbionts. Nature Microbiol. Rev. 2:43-56.
113. Harman, G. E., Lorito, M., Lynch, J. M. 2004. Uses of *Trichoderma* spp. to alleviate or remediate soil and water pollution. Adv. Appl. Microbiol. (accepted for publication).

Popular and Other Publications:

1. Harman, G. E., A. L. Grannett, and G. Nash. 1972. Seed deterioration by storage fungi. New York Food and Life Sciences Quarterly 5:19-22.
2. Harman, G. E., C. J. Eckenrode, and D. R. Webb. 1975. Microbes of seeds and seed maggots. New York Food and Life Sciences Quarterly 8:11-13.
3. Harman, G. E. 1978. Directory of Seed Pathologists in the Americas. Published at the New York State Agricultural Experiment Station by the American Phytopathological Society Committee on Seed Pathology.
4. Hubbard, J. P. and G. E. Harman. 1981. Biocontrol of seed-attacking fungi and insects. New York Food and Life Sciences Quarterly 13:15-17.
5. Baker, R. and G. E. Harman. 1981. Increased flower production by application of fungicides. Colorado Greenhouse Growers Association Research Bulletin 376.
6. Hubbard, J. P. and G. E. Harman. 1981. Decreased microbial colonization of seeds with seed maggot resistance. Annual Report of the Bean Improvement Cooperative 24:120-121.

7. Mathur, S. B., P. Neergaard, C. Anselme, and G. E. Harman. 1982. World Survey of Seed Pathology Projects and Directory of Seed Pathologists. The International Seed Testing Association, Zurich, Switzerland. 92 pg.
8. Harman, G. E. 1988. Research in biocontrol of plant pathogens. New York Food Life Science Quarterly 17:9-12.
9. Bergstrom, G. C., D. W. Kalb, G. E. Harman, C. Samimy, and M. E. Sorrels. 1989. Effect of seed treatments on agronomic perfomance of soft red winter wheat from 'scabby' seed, 1988. Fungicide and Nematicide Tests. 44:218.
10. Bergstrom, G. C., D. W. Kalb, G. E. Harman, and T. E. Stasz. 1989. Effect of seed treatment with Trichoderma spp. on the agronomic performance of soft red winter wheat from 'scabby' seed, 1988. Biological Cultural Tests for Control Plant Disease 4:61.
11. Kalb. D. W., G. C. Bergstrom, E. B. Nelson, G. E. Harman, and T. E. Stasz. 1989. Evaluation of seed-applied biocontrol agents on winter wheat in a site with a history of foot rot diseases, 1988. Biol Cultural Tests for Control of Plant Disease 4:54.
12. Wilcox, W. F. and G. E. Harman. 1992. Phytophthora stem and root rot: Phytophthora sojae. Biological Cultural Tests for Control of Plant Diseases 7:66.
13. Harman, G. E. and C. K. Hayes. 1994. Biologically-based technologies for pest control: pathogens that are pests of agriculture. A report prepared under contract to the Office of Technology Assessment, US Congress, 63 pg.

Book Chapters & Reviews:

1. Harman, G. E. 1983. Mechanisms of seed infection and pathogenesis. Phytopathology 73:326-329.
2. Harman, G. E. and Y. Hadar. 1983. Biological control of Pythium species. Seed Science and Technology 11:893-906.
3. Harman, G. E. and T. E. Stasz, 1986. Influence of seed quality on soil microbes and seed rots, In West, S. (ed.) Physiological-Pathological Interactions affecting Seed Deterioration. Crop Science Society of America, Madison, WI.
4. Harman, G.E. 1989. Realizing the promise of biological seed treatment. Proc. Beltwide Cotton Production Research Confrence, p. 15-16. National Cotton Council of America, Memphis, TN
5. Harman, G. E. and T. E. Stasz. 1991. Protoplast fusion for the production of superior biocontrol fungi. In Te Beest, D.C. (ed.). Microbial Weed Control. Chapman and Hall, New York p. 171-186.
6. Harman, G. E. and A. G. Taylor. 1990. Development of a successful biological seed treatment system. p.415-426 In Hornby, D. (ed.). Biological Control of Soil-borne Plant Pathogens. C.A.B. International, Wallinford, U.K.
7. Harman, G. E. and R. D. Lumsden. 1989. Biological disease control. p. 259-280 In Lynch, J.M. (ed.). The Rhizosphere. J. Wiley & Sons, Chichester, U.K.
8. Harman, G. E. 1989. Deployment tactics for biocontrol agents in plant pathology. p. 779-792 In Baker, R. and P. Dunn (ed.). New Directions in Biological Control. UCLA Symposium on Molecular and Cellular Biology, New Series, Vol. 112:779-792. Alan R. Liss, Inc., N.Y.
9. Taylor, A. G. and G. E. Harman. 1990. Concepts and technologies of selected seed treatments. Ann. Rev. Phytopathol. 28:321-339.
10. Harman, G. E. 1991. Seed treatments to biologically control plant diseases. In Papavizas, G. C.(ed.). Proc. of a Symposium of the Am. Assoc. Advance. Sci. Crop Protect. 10:166-171.
11. Jin, X., C. K. Hayes, and G. E. Harman. 1992. Principles in the development of biological control systems employing *Trichoderma* species against soil-borne plant pathogenic fungi. p. 174-195 In Leatham, G.F. (ed) Symposium on Industrial Mycology, Mycological Soc. Am., Brock/Springer Series in Contemporary Bioscience.
12. Taylor, A. G., T-G Min, G. E. Harman, and X. Jin. 1990 Liquid coating formulation to increase efficacy of biological seed treatments. pp. 119-124. National Symposium on Stand Establishment for Horticultural Crops. Univ. of Minnesota and Am. Soc. Hortic. Soc.
13. Harman, G. E. 1992. The development and benefits of rhizosphere competent fungi for biological control of plant pathogens. Journal of Plant Nutrition 15:835-843.
14. Harman, G. E. Control of soil-borne plant pathogens with biological control. Biol. Cult. Tests 6:v-viii.
15. Harman, G. E. 1992. Production and delivery systems for biocontrol agents. In Jensen, D. F., Hockenhull, J., and Fokkema, N. J. (eds.) New Approaches in Biological Control of Soil-Borne Diseases. International Organization for Biocntrol and The European Foundation for Plant Pathology. Copenhagen. p. 201-205.
16. Harman, G. E. and Tronsmo, A. 1992. Methods for genetic manipulation for the production of improved bioprotectant fungi. In Jensen, D. F., Hockenhull, J., and Fokkema, N. J. (eds.) New Approaches in Biological Control of Soil-Borne Diseases. International Organization for Biocntrol and The European Foundation for Plant Pathology. Copenhagen. p. 181-187.

17. Harman, G. E. and Tronsmo, A. 1992. Industrial-academe partnership: A critical requirement for the development of biocontrol systems. In Jensen, D. F., Hockenhull, J., and Fokkema, N. J. (eds.) New Approaches in Biological Control of Soil-Borne Diseases. International Organization for Biocontrol and The European Foundation for Plant Pathology. Copenhagen. p. 218.
18. Harman, G. E. and Hayes, C. K. 1993. The genetic nature and biocontrol ability of progeny from protoplast fusion in Trichoderma. In Chet, I. (ed). Biotechnology in Plant Protection. J. Wiley -Liss. p. 237-255.
19. Tronsmo, A., Skaugud, O., and Harman, G. E.. 1993. Use of chitin and chitosan in biological control of plant diseases. In Muzzarelli, R. A. A. (ed). Chitin Enzymology Eur. Chitin Soc., Ancona, Italy. p. 265-270.
20. Lorito, M., Hayes, C. K., Peterbauer, C., Tronsmo, A., Klemsdal, S., and Harman, G. E. 1993. Antifungal chitinolytic enzymes from Trichoderma harzianum and Gliocladium virens: purification, characterization, biological activity and molecular cloning. In Muzzarelli, R. A. A. (ed). Chitin Enzymology. Eur. Chitin Soc., Ancona, Italy. p.383-392.
21. Tronsmo, A., Klemsdal, S. S., Hayes, C. K., Lorito, M., and Harman, G. E. 1993. The role of hydrolytic enzymes produced by Trichoderma harzianum in biological control of plant diseases. In Suominen, P. and Reinikainen, T. Proc. of the Second Tricel Symposium on Trichoderma Cellulases and other Hydrolases. Foundation for Biotechnological and Industrial Fermenation Research 8:159-168.
22. Harman, G. E. and C. K. Hayes. 1993. The genome of biocontrol fungi: Modification and genetic components for plant disease management strategies. In Lumsden, R. D. and Vaughn, J. L. (eds). Pest Management: Biologically Based Technologies. Am. Chemical Soc. p. 347-354.
23. Harman, G. E. and E. B. Nelson. 1994. Mechanisms of protection of seeds and seedlings by biological seed treatments: implications for practical disease control. In Maude, R. (ed.), Seed Treatment, Progress and Prospects. British Crop Protection Council. p. 383-392.
24. Lorito, M., C. K. Hayes, A. Zoina, A., F. Scala, G. Del Sorbo, S. L. Woo, and G. E. Harman. 1994. Potential of genes and gene products from Trichoderma sp. and Gliocladium sp. for the development of biological pesticides. Molec. Biotechnol. 2:209-217.
25. Goldman, G. H., C. Hayes, and G. E. Harman. 1994. Molecular and cellular biology of biocontrol by Trichoderma spp. Trends in Biotechnol. 12:478-482.
26. Sundheim, L., Klemsdal, S., Lorito, M., Harman, G. A., and Tronsmo, A. 1995. Chitinolytic enzymes in the biological control of plant pathogens. In Manka, M. (ed.). Environmental Biotic Factors in Integrated Plant Disease Control. The Polish Phytopathological Soc., Poznan, Poland, p. 137-145.
27. Harman, G. E. and Lo, C-T. 1996. Development of Bio-Trek 22G, the first registered biological control control product for turf disease. TurfGrass Trends 5 (5):8-15.
28. Lorito, M.,Woo, S. L.,Harman, G. E.,Sposato, P.,Muccifora, S., and Scala, F. 1996. Genes encoding for chitinolytic enzymes from biocontrol fungi-applications for plant disease control. in: 95-102. Chitin Enzymology II. R. A. A. Muzzarelli, eds., Atec, Grottammare(AP), Italy.
29. Harman, G. E. and Björkman, T.. 1998. Potential and existing uses of *Trichoderma* and *Gliocladium* for plant disease control and plant growth enhancement. p. 229-265. In Harman, G. E. and Kubicek, C. P. (eds), *Trichoderma and Gliocladium*. Vol. 2. Taylor & Francis, London.
30. Harman, G. E., Hayes, C. K., and Ondik, K. L. 1998. Asexual genetics in *Trichoderma* and *Gliocladium*: Mechanisms and implications. p. 243-270. In Kubicek, C. P. and Harman, G. E. (eds), *Trichoderma and Gliocladium*. Vol. 1. Taylor & Francis, London.
31. Harman, G. E. 2000. Controlling plant pathogens and improving plant growth and productivity with biologicals. p. 101-110. In Copping, L. G. (ed.). Predicting Field Performance in Crop Protection.. British Crop Protection Council Symposium Proceeding no. 74.
32. Harman, G. E., & Donzelli, G. G. B. 2001. Enhancing crop performance and pest resistance with genes from biocontrol fungi. P. 114-125. In M. Vurro, Gressel, J., Butt, T., Harman, G., Pilgeram, A., St. Ledger, R J. and Nuss, D. L. (Eds.), Enhancing Biocontrol Agents and Handling Risks. Amsterdam: IOS Press.
33. Harman, G. E. 2001. Microbial tools to improve crop performance and profitability and to control plant diseases.p. 71-84. In D. D.-S. Tzeng (Eds.), Proceedings of International Symposium on Biological Control of Plant Diseases for the New Century--Mode of Action and Application Technology. Taichung City, Taiwan: National Chung Hsing University

Patents issued:

1. Smith, V. L., W. Wilcox, and G. E. Harman. Biological control of Phytophthora by Gliocladium. U. S. Patent 4,996,157, issued Feb. 26, 1991.
2. Smith, V. L., W. Wilcox, and G. E. Harman. Biological control of Phytophthora by Gliocladium. U. S. Patent 5,165,928, issued Nov. 24, 1992.
3. Harman, G. E., R. M. Broadway, A. Tronsmo, and M. Lorito. Purified chitinases and uses thereof. U. S. Patent 5,173,419, issued Dec. 22, 1992.

4. Stasz, T. E., G. E. Harman, and N. F. Weeden. Fused Biocontrol Agents. U. S. Patent 5,260,213, issued Nov. 9, 1993.
5. Harman, G. E., X. Jin., T. E. Stasz, G. P. Peruzzotti, A. C. Leopold, and A. G. Taylor. 1994. Method of increasing the percentage of viable dried spores of a fungus. U. S. Patent 5,288,634, issued Feb. 22, 1994.
6. Harman, G. E.. Lorito, M., Di Pietro, A., and Hayes, C. K. Synergy between fungal cell wall degrading enzymes and fungicides. US Patent 5,360,608, issued Jul. 5, 1994.
7. Harman, G. E., Lorito, M., and Hayes, C. K.. Synergy between fungal cell wall degrading enzymes and biocontrol bacteria, US Patnet 5,360,608, issued Nov. 1, 1994.
8. Harman, G. E., Hayes, C. K., Lorito, M., and Tronsmo, A. Gene encoding for endochitinase, US Patent 5,378,821, issued Jan. 3, 1995.
9. Harman, G. E.. Lorito, M., Di Pietro, A., and Hayes, C. K. Antifungal synergistic combination of enzyme fungicide and non-enzymatic fungicide and use thereof. U.S. Patent 5,433,947 issued July 18, 1995. This is a CIP to US Patent 5,362,561.
10. Harman, G. E., Hayes, C. K., Lorito, M., and Di Pietro, A. N-acetyl-ß-glucosaminidase isolated from *Trichoderma harzianum.* US patent 5,474,926, issued Dec. 12, 1995.
11. Harman, G. E., Tronsmo, A., Hayes, C. K., Lorito, M. and Klemsdahl, S. Gene encoding endochitinase. US patent 6,020,540 issued Feb. 1, 2000.
12. Broadway, R. M. and Harman, G. E. Fungus and Insect Control with Chitinolytic Enzymes, US patent 6,029,299 issued May 30, 2000.
13. Harman, G. E., Broadway, R. M., Tronsmo, A., Lorito, M., Hayes, C. K. and DiPietro, A. Purified chitinases and use thereof. US Patent 6,251,390, issued June 26, 2001.
14. Harman, G. E., Lorito, M., Di Pietro, A., Hayes, C. K., Scala, F. and Kubicek, C. P. 2003. Combinations of fungal cell degrading enzyme and fungal cell membrane affecting compound. US Patent 6,512,166, issued Jan. 28, 2003.