



Choong-Min Ryu– Curriculum vitae

Molecular Phytobacteriology Laboratory • Superbacteria Research Center • Korean Research Institute of Bioscience and Biotechnology (KRIBB) • P.O. Box 115 Yuseong • Daejeon 305-600

Phone: +82-+42- 879-8229 (Lab) • +82-+42- 4488 (Fax) • +82-+10- 8505-8229 (CP) •

E-mail: cmryu@kribb.re.kr

Persional ID: 700703-1889310

Research Interests

Plant-plant/Microbe communication

New tech combating against multi-drug resistance

Plant growth promotion by root-associated bacteria

Induced systemic resistance by rhizosphere bacteria

Biological control against plant pathogens

Plant/bacterial response by volatile organic compounds

Professional experience

- 2008. 3.–To date Principal Research Scientist, KRIBB, South Korea
- 2004. 9 – 2008.2. Senior Research Scientist, KRIBB, South Korea
- 2003. 2.- 2004. 9. Postdoctoral fellow, Plant Biology Division. The Samuel Roberts Noble Foundation, OK, USA
- 1991-1994: Military service in Navy, South Korea

Education

- 1998. 9.- 2002. 12. Ph.D. student in Department of Entomology and Plant Pathology, Auburn University, AL, USA
- 1996. 3. – 1998. 2 M. S. in Agricultural Biology, GyeongSang National University, South Korea.
- 1989. 3. – 1995. 8. - Bachelor Degree in Agricultural Biology. GyeongSang National University. South Korea .

Relevant Achievements

- Auburn University Presidential Graduate Fellow (1999 – 2002)
- Outstanding graduate student award at Auburn University (2001).
- Member of Gamma Sigma Delta (2002-)
- Young Plant Pathologist Award at Korea Society of Plant Pathology (2010)
- Outstanding Professor Award in University of Science and Technology (2009/2012)
- Outstanding Scientist in Daejeon (2013)

Scientific contribution

Referee for international journals: *mBio*, *Plant Physiology*, *Plant Molecular Biology*, *Phytopathology*, *Plant Pathology*; *Planta*; *Biological Control*; *European Journal of Plant Pathology*; *Plant and Soil*; *Journal of the Torrey Botanical Society*, *Journal of Microbiology and Biotechnology*; *The Plant Pathology Journal*, *PNAS*.

1/2005-12/2012: Member of the editorial board of *The Plant Pathology Journal*

1/2009-1/2013: Member of the editorial board of *Journal of Microbiology and Biotechnology*

8/2011-5/2015: Member of the editorial board of *BioControl*

10/2011-12/2015: Member of the editorial board of *Plant and Soil*

Since 9/2011: Member of the editorial review board of *Frontiers in Plant Science*

Since 06/2014: Member of the editorial board of *PLOS One*

Referred Publications

2016

1. Lee, B.; Park, Y.-S.; Lee, S. H.; and **Ryu, C.-M.** 2016. Bacterial RNAs activate innate immunity in Arabidopsis. **New Phytologist** **209**:785-797.
2. Jeong, H., Lee, D.-H., **Ryu, C.-M.**, Park, S.-H. 2016. Toward Complete Bacterial Genome Sequencing through the Combined Use of Multiple Next-Generation Sequencing Platforms. **Journal of Microbiology and Biotechnology** **26**:207-12.
3. Sharifi, R. and **Ryu, C.-M.** **2016**. Are bacterial volatile compounds poisonous odors to a fungal pathogen *Botrytis cinerea*, alarm signals to Arabidopsis

- seedlings for eliciting induced resistance, or both? **Frontiers in Microbiology** 7:196. doi: 10.3389/fmicb.2016.00196
4. Im, H., Kim, K. M., Lee, S.-H., and **Ryu, C.-M.**, 2016. Functional metagenome mining of soil for novel gentamicin resistance genes **Journal of Microbiology and Biotechnology** 26:521-529.
 5. Kim, B., Song, G. C., and **Ryu, C.-M.**, 2016. Root Exudation by Aphid Leaf Infestation Recruits Root-associated *Paenibacillus* spp. to Lead Plant Insect Susceptibility **Journal of Microbiology and Biotechnology** 26:549-557.
 6. Kim, M.H. Molecular Insights into Toluene Sensing in the TodS/TodT Signal Transduction System. **Journal of Biological Chemistry** 191: 8575-8590.
 7. Chung, J., Song, G.C., **Ryu, C.-M.** 2016. Sweet scents from good bacteria: Case studies on bacterial volatile compounds for plant growth and immunity. **Plant Molecular Biology** 90:677-687.
- 2015**
8. Jeon, J., D'Souza, R., Pinto, N., **Ryu, C.-M.**, Park, J., Yong, D., and Lee, K. 2016. Complete genome sequence of the siphoviral bacteriophage Bφ-R3177, which lyses an OXA-66-producing carbapenem-resistant *Acinetobacter baumannii* isolate. **Archives of Virology**, 160(12):3157-60
 9. Park, Y.S., and Ryu, C.-M. 2016. Inter-organ defense networking: Leaf whitefly sucking elicits plant immunity to crown gall disease caused by *Agrobacterium tumefaciens*. **Plant Signaling & Behavior**, 10(11):e1081325
 10. Park, Y.-S, Bae, D.-W., and **Ryu, C.-M.** 2015. Aboveground whitefly infestation modulates transcriptional level of anthocyanin biosynthesis and jasmonic acid signaling-related genes and drought tolerance on maize. **PLOS one** 10(12): e0143879. doi:10.1371/journal.pone.0143879
 11. Lee, S. M., Chung, J., **Ryu, C.-M.** 2015 Augmenting plant immune responses and biological control by microbial determinants. **Research in Plant Diseases** 21:161-179.
 12. **Ryu, C.-M.** 2015. Bacterial Volatiles as Airborne Signals for Plants and Bacteria in Principles of Plant-Microbe Interactions, B. Lugtenberg (ed.), Springer International Publishing Switzerland.
 13. Audrain, B., Farag, M.A., **Ryu, C.-M.**, Ghigo, J.M. 2015. Role of bacterial volatile compounds in bacterial biology. **FEMS Microbiology Reviews** 39:222-233.
 14. **Ryu, C.-M.** 2015. Against friend and foe: Type 6 effectors in plant-associated bacteria. **Journal of Microbiology** 53:201-208
 15. Song, G. C.; Lee, S. H.; Hong, J.; Choi, H. K.; Hong, G. H.; Bae, D.-W.; Mysore, K.; Park, Y.-S.; and **Ryu, C.-M.** 2015. Aboveground insect infestation attenuates belowground *Agrobacterium*-mediated genetic transformation. **New Phytologist** 207:148-158.
 16. Jeong, H., Kloepper, J. W., and Ryu, C.-M. 2015. Genome sequence of rhizobacterium *Serratia marcescens* strain go-166, which triggers induced

- systemic resistance and plant growth promotion. **Genome announcements** 3 (3), e00667-15
17. Jeong, H., Kloepper, J. W., and Ryu, C.-M. 2015. Genome Sequences of *Pseudomonas amygdali* pv. *tabaci* Strain ATCC 11528 and pv. *lachrymans* Strain 98A-744. **Genome announcements** 3 (3), e00683-15
 18. Park, Y.-S, Park, K. S., Kloepper, J. W., and Ryu, C.-M. 2015. Plant Growth-Promoting Rhizobacteria Stimulate Vegetative Growth and Asexual Reproduction of *Kalanchoe daigremontiana*. **The Plant Pathology Journal** 31(3):310-5.
 19. Hossain, M. J., Ran, C., **Ryu, C.-M.**, Rasmussen-Ivey, C., Williams M., Hassan, M. K. , Choi S.-K., Jeong, H., Newman, M., Kloepper, J. W., and Liles, M. R., 2015. Deciphering the conserved genetic loci implicated in plant disease control through comparative genomics of *Bacillus amyloliquefaciens* subsp. *Plantarum*. **Frontiers in Plant Science**. 6:631. doi: 10.3389/fpls.2015.00631.
 20. Song, G.C., Choi, H.K., and **Ryu, C.-M.** 2015. Gaseous 3-pentanol primes plant immunity against a bacterial speck pathogen, *Pseudomonas syringae* pv. *tomato* via salicylic acid and jasmonic acid-dependent signaling pathways in *Arabidopsis*. **Frontiers in Plant Science** 6, 821

2014

21. Jeong, H., Choi, S.-K., Kloepper, J. W., and **Ryu, C.-M.** 2014. Genome Sequence of the plant endophyte *Bacillus pumilus* INR7 triggering induced systemic resistance in field crops. **Genome Announcement** 2(5):e01093-14.
22. Choi, S.-K., Jeong, H., Kloepper, J. W., and **Ryu, C.-M.** 2014. Genome Sequence of *Bacillus amyloliquefaciens* GB03, an active ingredient of the first commercial biological control product. **Genome Announcement** 2(5):e01092-14.
23. Park, Y.-S. and **Ryu, C.-M.** 2014. Understanding cross-communication between aboveground and belowground tissues via transcriptome analysis of a sucking insect whitefly-infested pepper plants. **Biochemical and Biophysical Research Communications** 443: 272–277
24. Yoo, S. J., Kim, S.-H., Kim, M.-J., **Ryu, C.-M.**, Kim, Y. C., Cho, B. H., and Yang, K.-Y. 2014. Involvement of the OsMKK4-OsMPK1 Cascade and its Downstream Transcription Factor OsWRKY53 in the Wounding Response in Rice. **The Plant Pathology Journal** 30 : 168-177.
25. Park, Y.-S. and **Ryu, C.-M.** 2014. Genome Sequence and Comparative Genome Analysis of *Pseudomonas syringae* pv. *syringae* Type Strain ATCC 19310. **Journal of Microbiology and Biotechnology** 24(4):563-7.
26. Choi, H. K., Song, G. C., Yi, H-S., and Ryu, C-M., 2014. Field evaluation of the bacterial volatile derivative 3-pentanol in priming for induced resistance in pepper. **Journal of Chemical Ecology** 40:882–892.

2013

27. Song, G. S., Ryu, S. Y., Kim, Y. S., Lee, J. Y., Choi, J. S., Choi, H. K., and **Ryu, C.-M.** 2013 Elicitation of induced resistance against *Pectobacterium carotovorum* and *Pseudomonas syringae* by specific individual compounds derived from native Korean plant species. **Molecules** 18: 12877-12895.
28. Lee, J.-H., Cho, H. S., Joo, S. W., Regmic, S. C., Kim, J.-A., **Ryu, C.-M.**, Ryu, S. Y., Cho, M. H., and Lee, L. 2013. Diverse plant extracts and trans-resveratrol inhibit formation of biofilm and swarming by *Escherichia coli* O157:H7. **Biofouling** 10, 1189–1203.
29. Lee, B., Park, Y.-S., Yi, H.-S., and **Ryu, C.-M.** 2013. Systemic induction of the small antibacterial compound in the leaf exudate during benzothiadiazole-elicited systemic acquired resistance in pepper. **The Plant Pathology Journal** 29:350-355.
30. Farag, M. A., Zhang, H., and **Ryu, C.-M.**, 2013. Dynamic chemical communication between plants and bacteria through airborne signals: Induced resistance by bacterial volatiles **Journal of Chemical Ecology** 39:1007–1018
31. Choi, O., **Ryu, C.-M.**, Kim, J., 2013. Biological seed treatment : Viable population changes of *Paenibacillus polymyxa* on seed and root and its antagonistic activity after seed formulation. **Journal of Agriculture & Life Science** 47: 39-47.
32. Sang, M. K., Kim, H.-S., Myung, I.-S., **Ryu, C.-M.**, Kim, B. S., and Kim, K. D. 2013. *Chryseobacterium kwangjuense* sp. nov., isolated from pepper (*Capsicum annuum* L.) root. **International Journal of Systematic and Evolutionary Microbiology** 63: 2835-2840 .
33. Yi, H-S, Yang, J. W., and **Ryu, C.-M.** 2013. ISR meets SAR outside: Additive action of the endophyte *Bacillus pumilus* INR7 and the chemical inducer, benzothiadiazole, on induced resistance against bacterial spot in field-grown pepper. **Frontiers in Plant Science** 4:122. doi: 10.3389/fpls.2013.00122.
34. **Ryu, C.-M.** 2013. Promoting plant protection by root-associated bacteria. **The Plant Pathology Journal** 29:123-124.
35. **Ryu, C.-M.**, Choi, H. K., Lee, C.-H., Murphy, J. F., Lee, J.-K., Kloepper, J. W. 2013. Modulation of quorum sensing in acyl-homoserine lactone-producing or -degrading tobacco plants leads to alteration of induced systemic resistance elicited by the rhizobacterium *Serratia marcescens* 90-166. **The Plant Pathology Journal** 29:224-230.
36. **Song, G. C** and **Ryu, C.-M.** 2013. Two volatile organic compounds trigger plant self-defense against a bacterial pathogen and a sucking insect in cucumber under open field conditions. **International Journal of Molecular Science** 14: 1- x manuscripts; doi:10.3390/ijms140x000x
37. Park, H. B., Lee, B., Kloepper, J. W., and **Ryu, C.-M.** 2013. One shot-two pathogens blocked: Exposure of *Arabidopsis* to hexadecane, a long chain volatile organic compound, confers induced resistance against both *Pectobacterium carotovorum* and *Pseudomonas syringae*. **Plant Signaling & Behavior** 8:7, e24619

38. Kim, K.-S., Lee, S., and **Ryu, C.-M.** 2013. Interspecific bacterial sensing by airborne signals modulates locomotion and drug-resistance. **Nature Communications** 4:1809 doi: 10.1038/ncomms2789 .
39. Song, G. S., Choi, H. K., and **Ryu, C.-M.** 2013. The folate precursor para-aminobenzoic acid elicits induced resistance against *Cucumber mosaic virus* and *Xanthomonas axonopodis*. **Annals of Botany** 111:925-993.

2012

40. Lee, B., Farag, M. A., Park, H. B., Kloepper, J. W., Lee, S. H., and **Ryu, C.-M.** 2012. Induced Resistance by a Long-Chain Bacterial Volatile: Elicitation of Plant Systemic Defense by a C13 Volatile Produced by *Paenibacillus polymyxa*. **PLoS One** 7: e48744.
41. Kim, K.-S., Park, S., Lee, S., Kang, S. B., Lee, J., Lee, S.-G., **Ryu, C.-M.** 2012. A novel fluorescent reporter system for monitoring and identifying RNase III activity and its target RNAs. **RNA Biology** 9:1167-1176
42. Hahm MS, Sumayo M, Hwang YJ, Jeon SA, Park SJ, Lee JY, Ahn JH, Kim BS **Ryu, C.-M.**, Ghim SY. 2012. Biological control and plant growth promoting capacity of rhizobacteria on pepper under greenhouse and field conditions. **Journal of Microbiology** 50:380-385.
43. Jeong, H., Jeong, D.-E., Kim, S. H., Song, G. C., Park, S.-Y., **Ryu, C.-M.**, Park, S.-H., and Choi, S.-K., 2012. Draft Genome Sequence of a Plant Growth-Promoting Bacterium *Bacillus siamensis* KCTC 13613T. **Journal of Bacteriology** 194:4148-4149.
44. Yi, H-S., Yang J. W., Choi, H. K., Ghim S.-Y., and **Ryu, C.-M.** Benzothiadiazole-elicited defense priming and systemic acquired resistance against bacterial and viral pathogens of pepper under field conditions. **Plant Biotechnology Reporter** 6:373-380.
45. Kim, B. K., Chung, J.-h., Kim, S.-Y., Jeong, H., Kang, S. G., Kwon, S.-K., Lee, C. H., Song, J. Y., Yu, D. S., **Ryu, C.-M.***, and Kim J. * 2012. Genome Sequence of the Leaf-Colonizing Bacterium, *Bacillus* sp. 5B6 Isolated from Cherry Tree. **Journal of Bacteriology** 194:3758-3759. (* = Corresponding author)
46. Lee, B., Lee S., and **Ryu, C.-M.** 2012. Foliar aphid feeding recruits rhizosphere bacteria and primes plant immunity against pathogenic and non-pathogenic bacteria in pepper. **Annals of Botany** 110:281-290.
47. Lee, M-H., Oh, K-H., Kang, C.-H., Kim, J., Oh, T.-K., **Ryu, C.-M.**, and Yoon, J.-H. 2012. Novel Metagenome-derived Cold-adapted Alkaline Phospholipase with Superior Lipase Activity as an intermediate between Phospholipase and Lipase. **Applied and Environmental Microbiology** 78:4959-4966.
48. Wang, K., Senthil-kumar, M., **Ryu, C.-M.**, Kang, L., and Mysore, K. S. 2012. Phytosterols play a key role in plant innate immunity against bacterial pathogens by regulating nutrient efflux into the apoplast. **Plant Physiology** 158: 1789-1802.

49. Rojas, C., Muthappa, S. K., Wang, K., **Ryu, C.-M.**, Amita, K., and Mysore, K. **2012**. Glycolate oxidase plays a major role during nonhost resistance responses by modulating reactive oxygen species mediated signal transduction pathways. **Plant Cell** 24:336-352.

2011

50. Yi, H.-S., Yang, J. W., Ghim, S.-Y., and **Ryu, C.-M.** **2011**. A cry for help from leaf to root: Recruiting rhizosphere microbes by aboveground insect attack leading to plant self-protection. **Plant Signaling and Behavior** 6: 1192 – 1194.
51. **Ryu, C.-M.**, Shin, J. N., Wang, Q., Mei, R., Kim, E. J., and Pan' J. G. **2011**. Potential for augmentation of fruit quality by foliar application of bacilli spores on apple tree. **The Plant Pathology Journal** 27:164-169.
52. Choi, J., Choi, D., Lee, S., **Ryu, C.-M.** and Hwang, I. **2011**. Cytokinin and plant immunity: Old foes or New friends . **Trends in Plant Science** 16:388-394.
53. Bae, H., Roberts D. P., Lim H.-S., Strem, M. D., Park, S.-C., **Ryu, C.-M.**, Melnick, R. L., and Bailey B. A. 2011. Endophytic *Trichoderma* Isolates from Tropical Environments Delay Disease Onset and Induce Resistance against *Phytophthora capsici* in Hot Pepper Using Multiple Mechanisms **Molecular Plant-Microbe Interactions** 24:3396-351.
54. Kim, Y. C., Leveau, J., McSpadden Gardener , B. B., Pierson, E. A., Pierson, L. S. III, and **Ryu CM.** **2011** The multifactorial basis for plant health promotion by plant-associated bacteria. **Applied and Environmental Microbiology** 77:1548-1555.
55. Yang, J. W., Yi, H.-S., Kim, H., Lee, B., Lee, S., Ghim, S.-Y., and Ryu, C.-M. 2011. Whitefly infestation elicits defense responses against bacterial pathogens on the leaf and root and belowground dynamic change of microflora in pepper. **Journal of Ecology** 99: 46-56.
56. Uppalapati S. R., Ishiga Y., **Ryu C.-M.**, Ishiga T., Wang K., Parker J., and Mysore K. S. **2011**. *SGT1/SGT1b* is required for coronatine signaling and *Pseudomonas syringae* pv. tomato disease symptom development in tomato and Arabidopsis. **New Phytologist** 189:83-93.

2010

57. Phi, Q-T., Park, Y-M., Seul, K-J., **Ryu, C.-M.**, Park, S-H., Kim, J-G., and Ghim, S-Y. 2010. Assessment of root-associated *Paenibacillus polymyxa* groups on growth promotion and induced systemic resistance in pepper. **Journal of Microbiology and Biotechnology** 20:1605-1613.
58. Kim J. F., Jeong, H., Park, S.-Y., Kim, S.-B., Park, Y. K., Choi, S.-K., **Ryu, C.-M.**, Hur, C.-G., Ghim, S.-Y., Oh, T. K., Kim, J. J., Park, C. S., and Park, S.-H. **2010**. Genome sequence of the polymyxin-producing plant-probiotic rhizobacterium *Paenibacillus polymyxa* E681. **Journal of Bacteriology** 192: 6103-6104.
59. Kwon, Y. S., Ryu, C.-M., Lee, S., Han, K. S., Lee, J. H., Lee K., Chung, W. S.,

- Jeong, M.-J., Kim, H. K., and Bae, D.-W. 2010. Proteome analysis of *Arabidopsis* seedlings exposed to bacterial volatiles. **Planta** 232:1355-1370
60. Wangdi T, Uppalapati SR, Nagaraj S, **Ryu CM**, Bender CL, Mysore KS. 2010. A role for chloroplast-localized Thylakoid formation 1 (THF1) in bacterial speck disease development. **Plant Signaling and Behavior** 5:425-427.
61. Yi, H-S., **Ryu, C-M.***, and Heil, M. 2010. Sweet smells prepare plants for future stress: airborne induction of plant disease immunity. **Plant Signaling and Behavior** 5: 528-531. (* = Corresponding author)
62. Yoon, J.H., Kang, S.J., Yi, H.S., Oh, T.K., and Ryu, C-M. 2010. *Rhizobium soli* sp. nov., isolated from soil. **International Journal of Systematic and Evolutionary Microbiology**. 60: 1387 – 1393
63. Shi, C.-L Park, H-B., Lee, J. S., and **Ryu, C-M.** 2010. Inhibition of primary roots and stimulation of lateral root development in *Arabidopsis thaliana* by the rhizobacterium *Serratia marcescens* 90-166 is through both auxin-dependent and -independent signaling pathways. **Molecules and Cells** 29: 251-258.
64. Wangdi T, Uppalapati SR, Nagaraj S, **Ryu CM**, Bender CL, Mysore KS. 2010. A virus-induced gene silencing screen identifies a role for Thylakoid Formation1 in *Pseudomonas syringae* pv. tomato symptom development in tomato and *Arabidopsis*. **Plant Physiology**. 152: 281-292.

2009

65. Yang, JW., Yu, S. H., and **Ryu, C-M.** 2009. Priming of defense-related genes confers root-colonizing bacilli-elicited induced systemic resistance in pepper. **The Plant Pathology Journal** 25:389-399.
66. Yi, H-S., Heil, M., Adame-Álvarez, R. M., Ballhorn, D. J., and Ryu, C-M. 2009. Airborne induction and priming of plant defenses against a bacterial pathogen. **Plant Physiology** 151: 2152-2161.
67. Kwon, S.J., Jin, H.C., Lee, S., Nam, M.H., Chung, J.H., Kwon, S.I., **Ryu, C.M.**, and Park, O.K. 2009. GDSL lipase-like 1 regulates systemic resistance associated with ethylene signaling in *Arabidopsis*. **The Plant Journal** 58:235-245.
68. Ham, M-S, Y-M. Park, H. R. Sung., M. Sumayo., **C-M. Ryu**, S.-H. Park, and S.-Y. Ghim. 2009. Characterization of Rhizobacteria Isolated from Family *Solanaceae* Plants in Dokdo Island. **Korean Journal of Microbiology Biotechnology** 37: 110–117.
69. Yang, JW., Kloepper, J. W., **Ryu, C.-M.** 2009. Rhizosphere bacteria help plant tolerate against abiotic stress. **Trends in Plant Science** 16:1-4.

2008

70. Lee, B., Kim, D., and **Ryu, C.-M.** 2008. A super-absorbent polymer combination promotes bacterial aggressiveness uncoupled from the epiphytic population. **The Plant Pathology Journal** 24: 283-288.

71. Kim, M. S., Cho, S. M., Kang, E. Y., Im, Y., Hwangbo, J. H., Kim, Y. C., **Ryu, C.-M.**, Yang, K. Y., Chung, G. C., and Cho, B. H. **2008**. Galactinol is a Signaling Component of the Induced Systemic Resistance Caused by *Pseudomonas chlororaphis* O6 Root Colonization. **Molecular Plant-Microbe Interactions** **21**: 1643-1653
72. Park, S.-J., S.-Y. Park., **C.-M. Ryu**, S.-H. Park, and J.-K. Lee. **2008**. AiiA, a quorum quenching enzyme of *Bacillus thuringiensis*, attenuates pathogenesis of *Erwinia carotovora* and rhizosphere competence on pepper root without change of bacterial community. **Journal of Microbiology and Biotechnology** **18**: 1518-1521.
73. Phi, Q-T, Park, Y-M, **Ryu, C-M.**, Park, S.-H, and Ghim, S-Y. **2008**. Functional Identification and Expression of Indole-3-Pyruvate Decarboxylase from *Paenibacillus polymyxa* E681 **Journal of Microbiology and Biotechnology**. **18**: 1235–1244
74. Park, S-Y, Kim, R., **Ryu, C-M.**, Choi, S-K., Lee, C-H., Kim, J-G., Park, S-H. **2008**. Citrinin, a mycotoxin from *Penicillium citrinum*, plays a role in inducing motility of *Paenibacillus polymyxa*. **FEMS Microbiology Ecology** **65**: 229-237.
75. Cho, S. M., Kang, B. R., Han, S. H., Anderson, A. J., Park, J.-Y., Lee, Y.-H., Cho, B. H., Yang, K.-Y., **Ryu, C.-M.**, and Kim. Y. C., **2008**. 2R,3R-butanediol, a bacterial volatile produced by *Pseudomonas chlororaphis* O6 is involved in induction of systemic tolerance to drought in *Arabidopsis thaliana*. **Molecular Plant-Microbe Interactions** **8**: 1067-1075.
76. Park, K. S. J.W. Kloepper, and **Ryu, C-M.** **2008**. Rhizobacterial exopolysaccharides elicit induced resistance on cucumber **Journal of Microbiology and Biotechnology** **18**: 1095-1100.
77. Phi, Q. T., Oh, S.-H., Park, Y-M., Park, S.-H., **Ryu, C.-M.**, and Ghim, S.-Y. **2008**. Isolation and Characterization of Transposon-Insertional Mutants from *Paenibacillus polymyxa* E681 Altering the Biosynthesis of Indole-3-Acetic Acid. **Current Microbiology** **56**: 524-530
78. Kim, Y-C, SY Park, **C-M. Ryu** * and JM Park*, **2008**, Molecular characterization of a pepper C2 domain-containing SRC2 protein implicated in resistance against host and non-host pathogens and abiotic stresses. **Planta** **227**:1169-1179. (* = Co-corresponding author)
79. Ajith A., S. R. Uppalapati, **C-M. Ryu**, A. Stacy, L. Kang, Y. Tang and K. Mysore. **2008**. Salicylic acid and systemic acquired resistance play a role in attenuating the crown gall disease caused by *Agrobacterium tumefaciens* **Plant Physiology** **146**:703-715.
- 2007**
80. **Ryu, C-M**, B. R. Kang, S. H. Han, S, M, Cho, J. W. Kloepper, A. J. Anderson, and Y. C. Kim. **2007**. Tobacco cultivars vary in induction of systemic resistance against *Cucumber mosaic virus* and growth promotion by *Pseudomonas chlororaphis* O6 and its *gacS* mutant. **European Journal of Plant Pathology**

- 119:383-390.
81. Zhang H, Kim MS, Krishnamachari V, Payton P, Sun Y, Grimson M, Farag MA, **Ryu CM**, Allen R, Melo IS, Pare PW. **2007**. Rhizobacterial volatile emissions regulate auxin homeostasis and cell expansion in Arabidopsis. **Planta** 226: 839-851.
 82. Seul, K.-J. , S.-H. Park , **C.-M. Ryu** , Y.-H. Lee , and S.-Y. Ghim
Proteome Analysis of *Paenibacillus polymyxa* E681 Affected by Barley.
Journal of Microbiology and Biotechnology 17:934-944..
 83. Jeong, J.-H., Jeong, D.-E., Lee, S.-J., Seul, K.-J., **Ryu, C.-M.**, Park, S.-H., Ghim, S.-Y. **2007** The effects of wood vinegar on growth and resistance of peppers **Korean Journal of Microbiology and Biotechnology** 35: 41-44
 84. Yi, S. Y., Choi D., Ryu, C.-M. **2007** Implication of a pepper h-type thioredoxin in type I- and II-nonhost resistance to *Xanthomonas axonopodis* **Plant Biotechnology Reports** 1:117-123
 85. Cho, H-S; Park, S-Y., **Ryu, C.-M.**, Kim, JF., Kim, J.-G., Park, S.-H. **2007**. Interference of quorum sensing and virulence of the rice pathogen *Burkholderia glumae* by an engineered endophytic bacterium. **FEMS Microbiology Ecology** 60: 14-23.
 86. **Ryu, C-M**, J. F. Murphy, M. S. Reddy, and J. W. Kloepper, **2007**, A two-strain mixture of rhizobacteria elicits induction of systemic resistance against *Pseudomonas syringae* and *Cucumber mosaic virus* coupled to promote plant growth on *Arabidopsis thaliana*. **Journal of Microbiology and Biotechnology** 17: 280-286.
 87. Kang, S. H., Cho, H-S., Cheong H., **Ryu, C-M.**, Kim, J. F., and Park, S. H. 2007 Two Bacterial Endophytes, *Pseudomonas rhodesiae* and *Pantoea ananatis*, Elicit Plant Growth Promotion and Plant Defense on Pepper. **Journal of Microbiology and Biotechnology** 17: 96-103.
 88. Anand, A., Vaghchhipawala, Z., **Ryu, C.-M.**, Kang, L., Wang, K., del-Pozo, O., Martin, G. B., and Mysore, K. S. **2007**. Identification and characterization of genes involved in *Agrobacterium*-mediated plant transformation by virus-induced gene silencing. **Molecular Plant-Microbe Interactions** 19: 41-52.

2006

89. Ryu, C-M, Kim' J., Choi O., Kim' S. H., Park, C. S. **2006**. Improvement of Biological Control Capacity of *Paenibacillus polymyxa* E681 by Seed Pelleting on Sesame. **Biological Control** 39: 282-289.
90. Kloepper, J. W. and. **Ryu, C. M.** **2006** Bacterial Endophytes as Elicitors of Induced Systemic Resistance in Who is an endophyte? Schulz/ Boyle/ Sieber Eds, Springer-Verlag Berlin Heidelberg, pp. 33-52. (A Book chapter)

91. Farag, M. A., **Ryu, C.-M.**, Sumner, L. W., Paré P. W. **2006**. Profiling of rhizobacterial emissions reveals prospective inducers of growth promotion and induced systemic resistance in plants. **Phytochemistry** 67: 2262-2268.
92. Chung, E, **Ryu, C-M**, Oh, S-K, and Choi D. **2006**. The essential role of pepper *CaSgt1* and *CaSkp1* genes in plant development and basal resistance. **Physiologia Plantarum** 126: 605-612.
93. Oh, S-K, Lee, S, Chung, E, Park, J. M, Yu, S. H., **Ryu, C-M***, and Choi D*. **2006**. Insight into Types I and II nonhost resistance using expression patterns of defense-related genes in tobacco **Planta** 213:1102-1107 (***Co-corresponding author**)
94. Kim M., Lee, S., Park, K., Jeong, E.-J., **Ryu, C.-M.**, Choi, D., and Pai, H.-S. **2006** Comparative microarray analysis of programmed cell death induced by proteasome malfunction and hypersensitive response in plants. **Biochemical and Biophysical Research Communications** 342:514-521.]

2005

95. Jeong, H., Park, S-Y., **Ryu, C-M.**, Kim, J. F., W. Choi, O. H., Park, S. Y., Park, S., and Park, C-S. **2005**. Diversity of root-associated *Paenibacillus* spp. in winter crops from southern part of Korea. **Journal of Microbiology and Biotechnology** 15: 1286-1298.
96. **Ryu, C-M.**, Kim, J. W. Choi, O. H., Park, S. Y., Park, S. H., and Park, C-S. **2005**. Nature of a root-associated *Paenibacillus polymyxa* from field-grown winter barley in Korea. **Journal of Microbiology and Biotechnology** 15: 984-991.
97. Paré, P. W., Farag, M. A., **Ryu, C.-M**, and Kloepper, J. W. **2005**. Elicitors and priming agents initiate plant defense responses. **Photosynthesis research** 85: 149-159.
98. **Ryu, C. M.**, Hu, C. H., Locy, R. D., and Kloepper, J. W. **2005**. Study of mechanisms for plant growth promotion elicited by rhizobacteria in *Arabidopsis thaliana* **Plant and Soil** 286: 285-292.
99. **Ryu, C.-M***, Farag, M. A., Paré, P. W., and Kloepper, J. W. **2005**. Invisible signals from the underground: bacterial volatiles elicit plant growth promotion and induce systemic resistance. **The Plant Pathology Journal** 21: 7-12. (***Corresponding author**)

2004

100. Choi, O. H., Kim, J. W., **Ryu, C.-M.**, and Park, C. S. **2004**. Colonization and population changes of a biocontrol agent, *Paenibacillus polymyxa* E681, in seeds and roots. **The Plant Pathology Journal** 20: 97-102.

101. Kloepper, J. W., **Ryu, C.-M.**, and Zhang, S. **2004**. Induced systemic resistance and promotion of plant growth by *Bacillus* spp. **Phytopathology** **94**: 1259-1266.
102. **Ryu C.-M.**, Anand A., Kang L., Mysore K. S. **2004**. Agrodrench: a novel and effective agroinoculation method for virus-induced gene silencing in roots and diverse Solanaceous species. **The Plant Journal** **40**: 322-331.
103. Mysore, K. S. And **Ryu. C. -M.** **2004**. Nonhost resistance: How much do we know? **Trends in Plant Science** **9**: 97-104
104. **Ryu, C. -M.**, Murphy, J. F., Mysore, K. S., and Kloepper, J. W. **2004**. Plant Growth-Promoting Rhizobacteria Protect Systemically *Arabidopsis thaliana* against *Cucumber mosaic virus* by a salicylic acid and NPR1-independent and jasmonic acid-dependent signaling pathway. **The Plant Journal** **39**: 381-392.
105. **Ryu, C. M.**, Farag, M., Hu, C. H., Reddy, M. S., Pare, P., and Kloepper, J. W. **2004**. Bacterial volatiles induced systemic resistance in *Arabidopsis*. **Plant Physiology** **134**: 1017-1026.

2003

106. **Ryu, C. M***, Hu, C. H., Reddy, M. S., and Kloepper, J. W. **2003**. Different signaling pathways of induced resistance by rhizobacteria in *Arabidopsis thaliana* against two pathovars of *Pseudomonas syringae*. **New Phytologist** **160**: 413-420. (*Corresponding author)
107. Spencer, M., **Ryu, C. M.** Kim, Y. C. and Anderson, A. 2003. Induced defence in tobacco by *Pseudomonas chlororaphis* strain O6 involves at least the ethylene pathway **Physiological and Molecular Plant Pathology** **63**: 27-34.
108. J. F. Murphy, M. S. Reddy, **Ryu, C.-M.** J. W. Kloepper, and R. Li. **2003**. Rhizobacteria-Mediated Growth Promotion of Tomato Leads to Protection Against *Cucumber mosaic virus*. **Phytopathology** **93**:1301-1307.
109. **Ryu, C. M.**, Farag, M., Hu, C. H., Reddy, M. S., H-S. Wei, Pare, P., and Kloepper, J. W. **2003**. Bacterial volatiles promote growth in *Arabidopsis* **Proceedings of National Academy of Sciences in USA** **100**:4927-4932.

2002

110. Yan, Z., Reddy, M. S., **Ryu, C. M.**, McInroy, J., Woods, F., Wilson, M., and Kloepper, J. W. **2002**. Induced systemic protection against tomato late blight elicited by plant growth-promoting rhizobacteria. **Phytopathology** **92**:1329-1333.

1988

111. Kim, J. W., Choi, O. H., Kang, J. H., **Ryu, C. M.**, Jeong, M. J., Kim, J. W., and Park, C. S. **1988**. Tracing of some root colonizing *Pseudomonas* in the rhizosphere using *lux* gene introduction bacteria. **Korean J. Plant Pathol.** **14**: 13-18.

Book Chapters or Proceedings

1. Kim, Y.-C., Glick, B. R., Bashan, Y., and Ryu, C.-M. **2012**. Enhancement of Plant Drought tolerance by Microbes. In **Plant Responses to Drought Stress**, (Ricardo Aroca Ed), Springer, Heidelberg, New York. Pp. 383-416.
2. **Ryu, C-M**, Yi, H-S, Ahn, Y-R, Kim, W-I, Zhang, H, Park S-H, Park, C-S, Farag, M. A., Paré, P W., and Kloepper, J. W. **2008**. Dynamic communication between plants and rhizobacteria *via* volatile signals In: **Biology of Molecular Plant-Microbe Interactions**, Vol. 6 (M. Lorito, S. Woo and F. Scala, eds), The International Society for Molecular Plant-Microbe Interactions, St. Paul, MN.
3. Kloepper, J. W. Gutiérrez-Estrada, A. and **Ryu, C. M.** **2005**. Progress toward implementation of *Bacillus* spp. for plant growth promotion and biological control. In *Rhizosphere 2004-Perspectives and Challenges. A Tribute to Lorenz Hiltner*. Hartmann, A., Schmid, M., Wenzel, W. and Hisinger, Ph. (eds.). GSF, Neuherberg pp
4. **Ryu, C.-M**, Farag, M. A., Hu, C. H., Reddy, M. S., Paré, P. W., and Kloepper, J. W. **2004**. Volatiles produced by PGPR elicit plant growth promotion and induced resistance in Arabidopsis. In: 6th International Workshop on Plant Growth Promoting Rhizobacteria (M.S. Reddy, M. Anandaraj, S.J. Eapen, Y.R. Sarma, J.W. Kloepper, eds.), pp. 93-100. Indian Institute of Spices Research, Calicut, India.
5. Kloepper, J. W. and **Ryu, C. M.** **2006** Bacterial Endophytes as Elicitors of Induced Systemic Resistance in Who is an endophyte? Schulz/ Boyle/ Sieber Eds, Springer-Verlag Berlin Heidelberg pp. 33-52.
6. Reddy, M. S., **Ryu, C. M.**, and Kloepper, J. W. **2001**. Can bacteria boost tomato growth and yield? Highlight of Agricultural Research **Volume 48 No. 2 Summer 2001**.
<http://www.ag.auburn.edu/resinfo/highlightsonline/summer01/sum-reddy.html>.
7. Kim, S.H., C.S. Park, J.B. Park, **C.M. Ryu**, J.W. Kim and C.W. Kang. **1998**. Accelerated plant growth and biological control of soil-borne diseases using useful microorganisms in integrated mechanization system of Sesame (*Sesamum indicum* L.) production in Korea. 25th International Seed Testing Congress Seed Symposium 116p. Pretoria, Republic of South Africa.
8. **Ryu, C-M**. and Park, C-S. **1997**. Enhancement of plant growth induced by endospore forming PGPR strain, *Bacillus polymyxa* E681. Page 186-190 in : Plant

Growth-Promoting Rhizobacteria- Present Status and Future Prospects. Proc. Int. Workshop on Plant Growth-Promoting Rhizobacteria, 4th. A. Ogoshi, K. Kobayshi, Y. Homma, F. Komada, N. Knodo, S. Akino, eds. Nakanishi Printing, Sapporo, Japan.

Patents

1. **Ryu, C-M.** and Mysore, K. S. Elicitation of virus induced gene silencing by Agrodrench. 2004. (US#20060037105).
2. MODIFICATION OF PLANT DISEASE RESISTANCE 05-28-2009 (20090138988;
3. 박승환,김지현,이충환,최수근,정해영,김성빈,박연경,김루미,류충민,박수영, 폴리믹신 생합성 효소 및 이를 코딩하는 유전자 군 (출원번호 2005-120878; 05149USD1; 05149US, 등록번호: 750658)
4. 박승환,김지현,이충환,최수근,정해영,김성빈,박연경,김루미,류충민,박수영. 2006. 푸자리시딘 생합성 효소 및 이를 코딩하는 유전자 (출원번호: 2006-07304, 등록번호: 762315)
5. 류충민,이보영,이수현, 2007. 세균의 유전물질을 포함하는 식물 병원균에 대한 저항성을 증가시키기 위한 조성물, 방법 및 상기 방법에 의해 제조된 식물체 (출원번호: 2007-0118267, 등록번호: 10-0959251-000, 국외 ID: 07147PCT (PCT/KR07/005952), 07147US (12/744,008)
6. 박승환,류충민,박창석,김영철,김원일,김지현,김희규,최수근, 2007. 미생물 유래 대사물질을 이용한 식물 성장 촉진과 식물 보호 방법 (출원번호: 2007-0133917, 등록번호: 10-0946633-0000
7. 송재준,최헌영,여택화,김희식,류충민,구영환,김철호,박상우. 2008. 팜유 추출공정 폐기물을 이용한 생비료의 제조방법 (출원번호: 10-2008-0038385, 등록번호: 10-0938490-0000, 국외 ID: 08074ID (W-00200900523); 08074PCT (PCT/KR08/002486)
8. 류충민,이보영. 2008. 동물 바이러스 유래 s i R N A 를 생산하는 식물체 및 이의용도 (출원번호: 10-2008-0120859, 국외 ID: 08202PCT (PCT/KR08/007086)
9. 반재구,정흥채,류충민,임성근. 2009. 포자를 이용한 중금속 제거 (출원번호: 10-2009-0026805)
10. 정해영,한지희,윤성호,김지현,류충민,오태광,윤상필,정명환. 양성자 빔 조사에 의한 돌연변이 유도방법을 이용한 알코올 내성 미생물 변이체의 선별 방법 (출원번호: 10-2009-0080393)
11. 박승환,최수근,박수영,김지현,류충민. 2009. 재조합 바실러스 균을 이용한 폴리믹신 생산방법 (출원번호: 10-2009-0088575)

12. 류충민,이외수, 마틴. 식물 휘발성 물질에 의한 식물의 병 저항성 유도 방법 (출원번호: 10-2009-0088395)
13. 박승환,최수근,박수영,김지현,류충민. 2010. 트리데캅틴 생합성 효소 및 이를 코딩하는 유전자 (출원번호: 10-2010-0011968)
14. 박승환,최수근,박수영,김지현,류충민. 2010. 폴리믹신 B 또는 E 생합성 효소 및 이를 코딩하는 유전자 군 (출원번호: 10-2010-0037838)
15. 류충민,이외수,최혜경. 2010. 3-펜탄올을 유효성분으로 포함하는 식물병 방제용 조성물 (출원번호: 10-2010-0133116, 국외 ID: 100CDPCT-1 (PCT/KR2011/002886))
16. 류충민,양정욱. 2010. 토양 유래 바실러스 속 PB25 균주 및 이의 용도 (출원번호: 10-2010-0137852)
17. 류충민. 2010. 식물 생장의 영향을 최소화하면서 식물 전신유도저항성을 유도하는 종자처리 방법 (출원번호: 10-2011-0019299)
18. 류충민,박효비. 2011. 토양 메타게놈 유래의 식물병 저항성 관련 유전자 및 이의 용도 (출원번호: 10-2011-0047649)
19. 김광선,류충민,박선영,이수현. 2012. 프로모터 강도 또는 목적 단백질의 발현 양을 검출하기 위한 재조합 형광 번역 리포터 벡터 및 이의 용도 (출원번호: 10-2012-0036582).
20. 류충민,정준휘,반재구. 2012. 식물 성장 촉진 또는 식물 병 방제 활성을 갖는 바실러스 균주 및 이의 용도 (출원번호: 10-2012-0031038)
21. 류충민,송근철. 2012. 고온 처리 바실러스 배양액을 이용한 종자 프라이밍을 통한 식물 면역반응 유도 방법 (출원번호: 10-2012-0128531).
22. 김광선,김태연,이주연,류충민,이수현. 2013. 미생물의 생물막 형성을 조절하는 대장균 유래 YmdB 유전자 및 그의용도 (출원번호: 10-2013-0047972).
23. 류충민,이수현,김광선. 2013. 고초균 유래의 휘발성 유기 화합물을 유효성분으로 함유하는 세균의 운동성 저해 또는 항생제 감수성 증가용 조성물 및 이의 용도 (출원번호: 10-2013-0051673).

Grant activity

연구책임자

1. 전신유도저항성(induced systemic resistance)을 이용한 식물병 방제기술 개발 (연구책임자) 농림부, 1 억 4 천만원 X 4 년, (2006.4.25 – 2010.4.24)

2. Interface biology 를 이용한 식물-미생물 상호작용 분자표적 발굴 (연구책임자), KRIBB, 1 억 X 1 년 (2006.1.1.-2006.12.31)
3. 내생 미생물 유래 유도 물질 분리, 기전연구 및 실용화 (연구책임자), 진흥청, 1 억 X 4 년 (2007.4.25 – 2010.12.31)
4. BRET-Live Imaging 기술을 이용한 기주-기생체 상호작용 분자마커 개발 및 기능분석 (연구책임자), KRIBB, 1 억 X 2 년 (2007.1.1.-2008.12.31.)
5. 식물면역기전 기반 유용미생물/천연물 이용 친환경 나무관리기술 개발 (연구책임자), 대전시, 1 억 5 천만원 X 1 년 (2010.6.1.-2011.3.23)
6. 세균 이차대사산물 신호전달/생산 연구 (연구책임자), 미생물프런티어사업단, 1 억 5 천만원 X 4 년 (2008.5.1.-20)
7. Metagenome/천연물 기반 복합재해저항성 유도 작물보호제 개발 (연구책임자), 농림부, 1 억 2 천만원 X 3 년 (2009.4.10-2012.4.9)
8. 식물면역유도 휘발성물질에 의한 식물-식물 상호작용 연구 (연구책임자), 연구재단, 9 천만원 X 3 년 (2010.4.1.-2013.4.30)
9. 유용미생물 이용 친환경 나무관리기술 개발 (연구책임자), 대전시, 1 억 X 1 년 (2011.9.1.-2013.1.10)
10. 식물상호작용 microbiome 연구, 미래부, 0.5 억 (2011.12.1-2012.5.31)
11. 리포터식물 개발 (연구책임자), 차세대바이오그린, 0.7 억 X 4 년 (2010.5.1-2012.4.31)
12. 미생물 제제의 효능 진단 및 안전성 평가 시스템 개발 (연구책임자). IPET. 2.5 억 X 2 (2011.12.26-2013.1.15)

현재진행중인 과제

13. 인터지노믹스 기반 생체방어연구, 미래부 기초기술이사회, 10 억 X 10 년 (2011.1.1-현재)
14. LOHAS 생화학 작물보호제 개발 (연구책임자), 산업부, 2 억 X 5 년 (2010.4.1.-현재)
15. 효과지속형 광범위 프로바이오틱 작물 보호제개발, 산업부, 2.5 억 X 4 년 (2013.6.1-현재)
16. 식물 리포터 시스템 구축 및 구동 검정 (연구책임자), 차세대바이오그린, 0.8 억 X 4 년 (2013.2.1-2012.4.31)
17. 메타지놈 기반 난배양성 슈퍼박테리아 분석기술 개발 (연구책임자), 글로벌프런티어, 3 억 X 9 년 (2013.9.1-현재)
18. 슈퍼박테리아의 내성획득 기전 및 제어 연구 (참여연구원), 한국생명공학연구원 전문연구소 사업, 1.2 억 X 3 년 (2013.5.1-현재)

참여연구원

1. 형질전환 작물의 식품 및 환경 안전성 평가(참여연구원), 작물프런티어사업단, 3 천만원 X 4 년 (2007.6.1.-2011.3.31)
2. 양성자 이온빔을 이용한 생물체 돌연변이 기작 구명 및 국내외 연구진에 대한 저변 확대 (참여연구원) 양자빔프런티어사업단, (2008.4.1-2010.3.31)
3. Bacillus 속주균 이용 식물유용세균 유전체 기능분석 및 응용 (참여연구원), 미생물프런티어 사업단, (2006.4.1-2008.3.31)

Teaching Experience

2006- current Adjunct Professor, University of Science and Technology

(Lectures in English)

Classes:

Microbial Functional Genomics (2005, Spring)

Molecular Bacteriology (2006, Fall)

Plant Bacteriology (2008, Spring)

Molecular Plant-Microbe Interactions (2006, Spring, 2008 Fall, 2009 Fall, and 2010 Spring)

Grant Writing (2009, Fall)

Advanced Methology for Biology (2011, Spring)

Science and Movie (2008 Spring, 2011, Fall, 2013 Fall)

2010 Spring Chungnam National Univeristy (Chungnam National University)

Class: Plant-Microbe Interaction, in English

(Lectures in Korean)

2008 Fall Chonnam National Univeristy (Cheonnam National University)

Class: Scientific writing

Participation in projects for commercial development

Assessed bacterial products in development by a biocontrol company for potential induced systemic resistance. This activity involves both greenhouse (*in vivo*) and microtiter plate (*in vitro*) disease bioassays on three different plant systems, tobacco, tomato and Arabidopsis.

1. "Development of BioYield™ for growth and yield enhnacement of tomato and pepper transplants"1999 (Gustafson LLC, USA).
2. "Evaluation of AgraQuest bacteria for systemic acquired resistance" 2000 (Serenede, Inc., USA).

3. "Assessment of HA by VaccTech for induction of systemic resistance against plant diseases" 2001 (VaccTech, Inc., Korea).
4. "Assessment of the potential for *Bacillus pumilus* strain INR7 to induce systemic resistance in soybean" 2000 (Gustafson LLC, USA).
5. "Development of bio-fertilizer based on *Bacillus* spp" 2009. Malaysia

Invited speaker at international congresses

1. Volatiles produced by PGPR elicit plant growth promotion and induced resistance in *Arabidopsis*, Talk presented on 25th September 2004 at 6th International Workshop on Plant Growth Promoting Rhizobacteria, Calicut, India
2. Induced resistance against pathogens and insects by rhizobacteria. Talk presented on 11th July 2007 at KCIST-2007 International Symposium on Molecular Host-Parasite Interactions: New Horizon for Interface Biology. Jeju, S. Korea.
3. Dynamic communication between plant and rhizobacteria via volatile signal
Talk presented on 21-27th July 2007 at 9th International Congress of Molecular Plant-Microbe Interactions, Sorrento, Italy.
4. Induced resistance against pathogens and insects by rhizobacteria. Talk presented on 9th- 13th September 2007 at The 4th Solanaceae Genome Workshop. Jeju, S. Korea.
5. Resistance induced by rhizobacterial volatiles. Talk presented on 24-28th August 2008 at 9th International Congress of Plant Pathology, Torino, Italy.
6. Rhizobacterial volatiles as elicitors of plant defense and growth promotion. Talk presented on 17-22th May 2009 at 8th International PGPR workshop, Portland, USA.
7. Rhizobacterial volatiles as a biofertilizer and plant defense elicitor. Talk presented on 5-7th April 2009 at BIT's 2nd Annual World Congress of Industrial Biotechnology 2009, Seoul, Korea.
8. Use of bacterial volatiles to control plant disease. Talk presented on 23-27th May 2010 at 110th General Meeting of American Society for Microbiology 2010, San Diego, CA, USA.
9. Plant social networking system. Talk presented on 21st- 24th 2011 at The 2nd Asian PGPR Conference, Beijing, China
10. Proteome analysis of *Arabidopsis* seedlings exposed to bacterial volatiles. Talk presented on 25th 30th 2011 at Rhizosphere 3, Perth, Australia
11. 상온 Plasma 기술의 생명체 상호작용 응용연구, 광운대학교, 2011.11.18.
12. A brief history in the development of biological control agents in Korea, Talk presented on 5.23. 2011 at The 2nd Korea-Japan Joint Symposium, Fukuoka, Japan.

2012

13. 식물전신유도저항성을 이용한 미생물농약의 Paradigm Shift, 5.2.2012, 동부한농,
14. A cry for help from leaf and root : the plant social networking system, 6. 21. 2012. 농촌진흥청
15. A cry for help from leaf to root: Whitefly infestation elicits defense responses against bacterial pathogens on the leaf and root and belowground dynamic change of microflora in pepper. Talk presented on 8.19-25. 2012 at XXIV International Congress of Entomology, Daego, S. Korea.
16. Functional Metagenome Application for Induction of Plant Immunity. Talk presented on 9.13. 2012 at KOGO meeting, Seoul, S. Korea.
17. 식물도 소셜네트워크킹한다?! 식물의 대화 엿듣기, 9.26.2012. 경산, 영남대학교
18. 식물도 소셜네트워크킹한다?! 식물의 대화 엿듣기, 10.28.2012. 수원, 성균관대학교
19. Functional metagenome mining for prompting plant systemic defense, Talk presented on 10.28. 2012 at 10th Congress IPMP, JEJU, S. Korea

2013

20. 유도저항성 이용 새로운 생물농약개발, 5.2.2013, 목포시험장
21. Induction of plant immune responses by gaseous compounds against plant pathogens and insect pests, Talk presented on 4.21-24.2012 at 3rd Asian Conference for PGPR and other microbes, Hyatt Hotel. Manila, Philippines.
22. PGPR and Biocontrol, 4.29.2013, 포항. POSTECH
23. 유도저항성기반 새로운 종자처리 방법, 5.3.2013. 농우바이오
24. Aboveground insect feeding leads to the recruitment of rhizobacteria for plant self-protection against subsequent diverse attacks, Induced resistance in plants against insects and diseases: leaping from success in the lab to success in the field. 10-13 June 2013. Avignon, France
25. Induction of plant systemic defense by a gaseous compound against *Pseudomonas syringae* and aphid in cucumber in the open field. Induced resistance in plants against insects and diseases: leaping from success in the lab to success in the field. 10-13 June 2013. Avignon, France
26. Vitamin Bx-mediated induced resistance against Cucumber mosaic virus and *Xanthomonas axonopodis* in the pepper field. Induced resistance in plants against insects and diseases: leaping from success in the lab to success in the field. 10-13 June 2013. Avignon, France
27. Exploiting rhizosphere bacteria for promoting plant health, in Diponegoro University, in Semarang, Indonesia, 9.17.3013.
28. Waking sleeping beauty: 땅속미생물을 이용한 튼튼한 식물 만들기. 10.11.2013. 부산. 경성대학교.

29. **Exploiting Bacilli to Improve Plant Health: from the Small Success to the Large Field Reality**, 미생물연합학회. 10.17.2013. 서울.
30. 지적 생명체로서의 식물!, 숲해설가 모임. 10.21.2013. 대전
31. 지적 생명체로서의 식물!, 한의학연구원. 10.22.2013. 대전

Research collaborations

1. Dr. Joseph W. Kloepper (Auburn University, USA)- Plant growth promotion and induced systemic resistance by plant growth-promoting rhizobacteria
1. Dr. Martin Heil (Departamento de Ingeniería Genética, CINVESTAV – Irapuato, Mexico) Indirect defense against insect pest.
2. Dr. Nicole M. van Dam (Radboud University, Netherland)- Aboveground-belowground interactions in plants
3. Dr. Kirankumar Mysore (The Samuel Roberts Noble Foundation, USA)- Study of nonhost resistance factor on *Nicotiana benthamiana* by virus-induced gene silencing
4. Dr. Paul Pare (Texas Tech University, USA)- Isolation and characterization of volatiles produced by PGPR.
5. Dr. Anne Anderson (Uath State University, USA)- Study of mehcanisms of PGPR on induced resistance of tobacco: Active oxygen species related mechanisms.
6. Dr. Kyung Seuk Park (NAIST, Korea)- Evaluation of triggers isolated from PGPR on induced resistance on several crops.

Professional Memberships

- American Phytopathology Society
- American Society of Plant Biologist
- International Society for Molecular Plant-Microbe Interaction.
- Korean Society of Plant Pathology.
- Korean Society of Molecular Biology.