Curriculum Vitae

# Kyeongnam Kim


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## Education

**Ph.D.** **Kyungpook National University, Daegu, Republic of Korea** **2018-2022**

- *Department of Applied Biosciences – Environmental Toxicology*
- Dissertation title: Toxicological mechanisms of methyl bromide and its alternative fumigants (phosphine and ethyl formate) against *Arabidopsis thaliana* and quarantine insect pests using multi-omics approaches

**M.S.** **Kyungpook National University, Daegu, Republic of Korea** **2016-2018**

- *Department of Applied Biosciences – Environmental Toxicology*
- Thesis title: Heart Developmental Toxicity by Carbon Black Waste generated from Oil Refinery on Zebrafish Embryos (*Danio rerio*): Combined Toxicity on Heart Function by Nickel and Vanadium

**B.S.** **Kyungpook National University, Daegu, Republic of Korea** **2011-2014**

- *School of Applied Biosciences – Molecular Microbiology*

## Position Held

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| Research Prof. | Institute of Quality and Safety Evaluation of Agricultural Products, Kyungpook National University, Daegu, Republic of Korea | 2023.03-Present |
| Post-Doc. | Institute of Quality and Safety Evaluation of Agricultural Products, Kyungpook National University, Daegu, Republic of Korea | 2022.09-2023.02 |
| Post-Doc. | Department of Applied Biosciences (BK21 program), Kyungpook National University, Daegu, Republic of Korea | 2022.03-2022.08 |
| Instructor | School of Applied Biosciences, Kyungpook National University, Daegu, Republic of Korea | 2022.03-2023.02 |

## Research Interests

- Mechanisms of action of chemicals on plants and insects using Omics based molecular biology
- Environmental impact of agrochemicals and developing sustainable pest management strategies
- Environmental toxicology and ecotoxicology

## Publications

- †Authors equally contributed to this paper as first authors. / Students under my direct mentoring are underlined

1. **Kim, K.†,** Kim, C.†, Kwon, T.H., Jeon, H.J., Kim, Y., Cho, Y., Kim D., Lee, Y., Kim, D., Lee, B.H., Lee, S.E. Optimizing Ethyl Formate Fumigation in Greenhouse Cucurbit Crops for Efficient Control of Major Agricultural Pests, *Myzus persicae* and *Thrips palmi.* **2023.** *Chem. Biol. Technol. Agric.* (Revision)
2. Kim., M.J., Kang, D., Lee, G.D., **Kim, K.,** Kim, J., Shin, J.H., Lee, S.J. Interplays between Cyanobacterial Blooms and Antibiotic Resistance Genes. **2023.** *Environ. Int.* (Revision)

3. **Kim, K**., Lee, Y., Kim, Y., Kim, D., Kim, C., Cho, Y., Park, J., You, Y., Lee, B.H., Lee, S.E., Acute toxicity of ethyl formate to non-target organisms and reduction effect of sodium silicate on ethyl formate-induced phytotoxicity. **2023**. *Korean J. Environ. Biol.* (Accepted).
4. Kim, D.†, **Kim, K.†,** Lee, Y.H., Lee, S.E. Transcriptome and Micro-CT Analysis Unravels the Cuticle Modification in Phosphine-Resistant Stored Grain Insect Pest, *Tribolium castaneum* (Herbst). *Chem. Biol. Technol. Agric.* **2023** 10, 88.
5. **Kim, K**., Kim, D., Kwon, S.H., Roh, G.H., Lee, S., Lee, B.H., Lee, S.E., A Novel Ethyl Formate Fumigation Strategy for Managing Yellow Tea Thrips (*Scirtothrips dorsalis*) in Greenhouse Cultivated Mangoes and Post-Harvest Fruits. **2023** *Insects* 14(6), 568.
6. Jeon, H.J.†, Kim, C.†, **Kim, K.,** Lee, S.E. Piperlongumine treatment impacts heart and liver development and causes developmental delay in zebrafish (*Danio rerio*) embryos. **2023** *Ecotox Environ Safe* 258, 114995.
7. **Kim, K,** Kim, D, Kwon, T.H., Lee, B.H., Lee, S.E., Effective phytosanitary treatment for export of Oriental melons (*Cucumis melo* var L.) using ethyl formate and modified atmosphere packaging to control *Trialeurodes vaporariorum* (Hemiptera: Aleyrodidae). **2023** *Insects* 14, 442.
8. Kim, Y.†, Jeon, H.J.†, **Kim, K.,** Kim, C., Moon, J.K., Hwang, K.W., Lee, S.E. Enantioselective effect of trifloxystrobin in early-stage zebrafish (*Danio rerio*) embryos: Cardiac abnormalities impacted by E,E-trifloxystrobin enantiomer. **2023** *Environ Pollut* 327, 121537.
9. Jeon, H.J.†, Cho, Y.†, **Kim, K.,** Kim, C., Lee, S.E. Combined toxicity of 3,5,6-trichloro-2-pyridinol and 2-(bromomethyl) naphthalene in the early stages of zebrafish (*Danio rerio*) embryos: Abnormal heart development at lower concentrations via differential expression of heart forming-related genes. **2023** *Environ Pollut* 325, 121450.
10. Jeon, H.J.†, **Kim, K.**†, Kim, C., Lee, S.E. Antimelanogenic effects of curcumin and its dimethoxy derivatives: Mechanistic investigation using B16F10 melanoma cells and zebrafish (*Danio rerio*) embryos. **2023** *Foods* 12, 926.
11. Cho, Y.†, Jeon, H. J.†, **Kim, K.** Kim, C., Lee, S.E. Developmental toxicity of a pymetrozine photo-metabolite, 3-pyridinecarboxaldehyde, in zebrafish (*Danio rerio*) embryos: Abnormal cardiac development and occurrence of heart dysfunction via differential expression of heart formation-related genes. **2023** *Ecotox Environ Safe* 253, 114654.
12. **Kim, K.**†, Kim, C.†, Yoo, J., Kim, J.R., Kim, Y.H., Lee, S.E. Phosphine gas in the dark induces severe phytotoxicity in *Arabidopsis thaliana* by increasing a hypoxia stress response and disrupting the energy metabolism: Transcriptomic approaches. **2023** *J Hazard Mater* 43, 130141.
13. Jeon, H.J., **Kim, K**., Kim, C., Cho, Y., Kwon, T.H., Lee, B.H., Lee, S.E., Residual evaluation of ethyl formate in soil and crops after fumigation in green house. **2022**. *Korean J. Environ. Biol.* 40(3): 316-324.
14. Park, J., Kim, Y., Jeon, H. J., **Kim, K.,** Kim, C., Lee, S., Son, J., Lee, S.E. Acute and developmental toxic effects of mono-halogenated and halomethyl naphthalenes on zebrafish (*Danio rerio*) embryos: Cardiac malformation after 2-bromomethyl naphthalene exposure. **2022**. *Environ Pollut* 297, 118786.
15. **Kim, K**., Kim, C., Park, J., Yoo, J., Kim, W., Jeon, H.J., Kim, J.R., Lee, S.E., Reduction effects of N-acetyl-L -cysteine, L -glutathione, and indole-3-acetic acid on phytotoxicity generated by methyl bromide fumigation- in a model plant *Arabidopsis thaliana.* **2021**. *Korean J. Environ. Biol.* 39(3): 354-361.
16. Park, J., Kim, C., Jeon, H.J., **Kim, K**., Kim, M.J., Moon, J. K., Lee, S.E. Developmental toxicity of 3-phenoxybenzoic acid (3-PBA) and endosulfan sulfate derived from insecticidal active ingredients: Abnormal heart formation by 3-PBA in zebrafish embryos. **2021** *Ecotoxicol Environ Saf* 224, 112689.
17. **Kim, K.**, Park, M. G., Lee, Y. H., Jeon, H. J., Kwon, T. H., Kim, C., Park, J., Lee, B. H., Yang, J. O., Lee, S. E. Synergistic Effects and Toxic Mechanism of Phosphine with Ethyl Formate against Citrus Mealybug (*Planococcus citri*). **2021** *Appl Sci-Basel* 11 (21).
18. Choe, H., Kim, M. J., Jeon, H. J., **Kim, K**., Kim, C., Park, J., Shin, J., Lee, S. R., Lee, S. E. Acute toxicity of the insecticide EPN upon zebrafish (*Danio rerio*) embryos and its related adverse effects: Verification of abnormal cardiac development and seizure-like events. **2021** *Ecotox Environ Safe* 222.

19. **Kim, K.**†, Kim, C.†, Park, J., Jeon, H. J., Park, Y. J., Kim, Y. H.; Yang, J. O., Lee, S. E., Transcriptomic evaluation on methyl bromide-induced phytotoxicity in *Arabidopsis thaliana* and its mode of phytotoxic action via the occurrence of reactive oxygen species and uneven distribution of auxin hormones. **2021** *J Hazard Mater* 419, 126419.
20. **Kim, K**., Lee, S. E. Combined toxicity of dimethyl sulfoxide (DMSO) and vanadium towards zebrafish embryos (*Danio rerio*): Unexpected synergistic effect by DMSO. **2021** *Chemosphere* 270, 129405.
21. Kim, C., Choe, H., Park, J., Kim, G., **Kim, K**., Jeon, H. J., Moon, J. K., Kim, M. J., Lee, S. E.. Molecular mechanisms of developmental toxicities of azoxystrobin and pyraclostrobin toward zebrafish (*Danio rerio*) embryos: Visualization of abnormal development using two transgenic lines. **2021** *Environ Pollut* 270.
22. Jeon, H. J., **Kim, K.**, Kim, C., Kim, M. J., Kim, T. O., Lee, S. E. Molecular Mechanisms of Anti-Melanogenic Gedunin Derived from Neem Tree (*Azadirachta indica*) Using B16F10 Mouse Melanoma Cells and Early-Stage Zebrafish. **2021** *Plants-Basel* 10 (2).
23. Kim, Y. C., Lee, S. R., Jeon, H. J., **Kim, K.**, Kim, M. J., Choi, S. D., Lee, S. E. Acute toxicities of fluorene, fluorene-1-carboxylic acid, and fluorene-9-carboxylic acid on zebrafish embryos (Danio rerio): Molecular mechanisms of developmental toxicities of fluorene-1-carboxylic acid. **2020** *Chemosphere* 260.
24. Lee, H.K.†, **Kim, K.**†, Lee, J., Lee, J., Lee, J., Kim, S., Lee, S.E., Kim, J.H. Targeted toxico-metabolomics of endosulfan sulfate in adult zebrafish (*Danio rerio*) using GC-MS/MS in multiple reaction monitoring mode. **2020** *J Hazard Mater* 389, 122056.
25. **Kim, K**.†, Yang, J. O.†, Sung, J.Y., Lee, J.Y., Park, J. S., Lee, H.S., Lee, B.H., Ren, Y., Lee, D.W., Lee, S.E. Minimization of energy transduction confers resistance to phosphine in the rice weevil, *Sitophilus oryzae*. **2019** *Sci Rep* 2019, 9 (1).
26. Jeon, H.J., **Kim, K.**, Kim, Y.D., Lee, S.E. Naturally occurring Piper plant amides potential in agricultural and pharmaceutical industries: perspectives of piperine and piperlongumine. **2019** *Appl Biol Chem* 62 (1), 63.
27. **Kim, K.,** Lee, Y. H., Kim, G., Lee, B.H., Yang, J.O., Lee, S.E., Ethyl formate and phosphine fumigations on the two-spotted spider mite, *Tetranychus urticae* and their biochemical responses. **2019** *Appl Biol Chem* 62 (1).
28. **Kim, K.,** Wang, C.H., Ok, Y. S., Lee, S.E. Heart developmental toxicity by carbon black waste generated from oil refinery on zebrafish embryos (*Danio rerio*): Combined toxicity on heart function by nickel and vanadium. **2019** *J Hazard Mater* 363, 127-137.
29. **Kim, K.,** Park, J., Yang, J.O, Lee, S.E., Proteomic Evaluation of Insecticidal Action of Phosphine on Green Peach Aphids, *Myzus persicae*. **2018** *Appl Sci* 8 (10), 1764.
30. **Kim, K**., Jeon, H.J., Choi, S.D., Tsang, D. C. W., Oleszczuk, P., Ok, Y. S., Lee, H.S., Lee, S.E. Combined toxicity of endosulfan and phenanthrene mixtures and induced molecular changes in adult Zebrafish (*Danio rerio*). **2018** *Chemosphere* 194, 30-41.
31. Nam, T.H., Kim, L., Jeon, H.J., **Kim, K.**, Ok, Y.S., Choi, S.D., Lee, S.E. Biomarkers indicate mixture toxicities of fluorene and phenanthrene with endosulfan toward earthworm (*Eisenia fetida*). **2017** *Environ Geochem Health* 39 (2), 307-317.
32. Kim, L., Jeon, J.W., Son, J.Y., Park, M.K., Kim, C.S., Jeon, H.J., Nam, T.H., **Kim, K.**, Park, B.J., Choi, S.D., Lee, S.E., Concentration and distribution of polychlorinated biphenyls in rice paddy soils. **2017** *Appl Biol Chem* 60 (2), 191-196.

## Publications – Under-review and In preparation

1. **Kim, K.**, Kim, D., Jeong, M., Shin, J.H., Kim, J.R., Lee, S.E. Phosphine resistant biomarkers of the red flour beetle (*Tribolium castaneum*) based on transcriptomics with machine learning approaches. **2024** *Pest Manag. Sci.* **(In preparation)**
2. **Kim, K.,** Kim, C., Lee, S.E. Phytotoxic mechanism of ethyl formate fumigation towards *Arabidopsis thaliana* and application on nursery plants. **2024** *J. food. Agri. Chem.* (In preparation)

## Patents

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| 1 | Development of reducing chemicals and conditions on phosphine-induced phytotoxicity (10-2023-0036575) | 2023.03 |
| 2 | A method for reducing the weakening of imported seedlings by ethyl formate and a composition for fumigation control of quarantine pests (10-2023-0036574) | 2023.03 |
| 3 | A method for reducing damage to agricultural crops by ethyl formate and a protective agent for agricultural crops (10-2022-0182608, ***Technology Transfer-completed***) | 2022 |
| 4 | Method for reducing phytotoxicity of plant by methyl bromide (10-2022-0055032) | 2022 |
| 5 | Biomarkers for diagnosing phosphine resistance-induced insects (**Granted patent** (4th Apr.2021): 10-2240047) | 2018 |
| 6 | Biomarker composition for discriminating remaining endosulfan or determining toxicity of ensodulfan comprising wax ester (**Granted patent** (3th Mar.2021): 10-2225307) | 2017 |

## Experimental skills

1. Molecular biology techniques
   - DNA/RNA/Protein isolation, PCR (RT-PCR, qRT-PCR), Western blot, and Enzyme assays
   - Gene cloning, Microinjection, CRISPR-Cas9 tech., Genotyping, RNAi and so on.
2. Analytical instruments
   - LC: HPLC-DAD (and FLD), LC-MS/MS, and LC-Q-TOF-MS
   - GC: GC-MS, GC-FID (and ECD, NPD)
3. Fumigation methods: Methyl bromide, Ethyl formate, and Phosphine
4. Bioinformatics: R for Omics analysis (Transcriptomics, proteomics, lipidomics, and metabolomics)
5. Organism breeding skills
   - **Insects:** *Tribolium castaneum*, *Sitophilus oryzae*, *Rhyzopertha dominica*, *Galleria mellonella*, *Myzus persicae, Planococcus citri,* and so on
   - **Plants:** *Arabidopsis thaliana,* and various crops
   - **Other organisms.:** Cell lines (HepG2, AML12, C2C12, and B16F10), *Danio rerio, and Eisenia fetida*
6. Design tools: GraphPad Prism, Adobe Illustrator, Photoshop, and Premiere

## Grants, Fellowship, and Awards

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| 1. | **(*Current grant*)** Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education **- Project Title**: Development of mutant models of the red flour beetle (*Tribolium castaneum*) for assessing phosphine resistance mechanism and control | $89698.84 (/2 years) | 2022.09-2024.08 |
| 2. | The Excellent Prize of Oral Presentation in General session in KSAE | $80 | 2023 |
| 3. | The Top prize in the 4th BK21 Participating Education Group Performance Forum Excellent Performance Presentation Competition (Bioscience & Engineering Department) | $3737.45 | 2022 |
| 4. | The Top Prize in KNU Alumni Association Academic Award | $3737.45 | 2022 |
| 5. | The Top Prize in Participating Graduate Students Performance Sharing Presentation in the 4th BK21 Program | $768.90 | 2022 |
| 6. | 4th BK21 Government Scholarship Program: Doctor course | $38810.0 | 2018-2022 |
| 7. | The Top Prize of the Corteva award competition (Insecticide resistance: Mechanism and management) in KSAE | $768.90 | 2019 |
| 8. | 3rd BK21 Government Scholarship Program: Master course | $11044.8 | 2016-2018 |
| 9. | Excellent Paper Presentation Award in 3rd BK21 Program | | 2018 |
| 10. | Excellent Paper Presentation Award in KSABC | | 2017 |
| 11. | KNU Challenge Scholarship: Undergraduate Student (Tuition) | $84328.0 | 2012-2014 |
| 12. | KNU Challenge Scholarship – Global program (Australia) | $1917.5 | 2013 |
| 13. | KNU Challenge Scholarship – Global program (Philippine) | $1917.5 | 2012 |
| 14. | KNU Undergraduate Student Tutoring Service Scholarship | $920.40 | 2013-2014 |

## Conferences & Symposia

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|---|---|---|---|
| 1 | American Chemistry Society (ACS) Fall in San Francisco, CA. | Poster | Sep., 2023 |
| 2 | Spring International Conference of Korean Society of Applied Entomology (KSAE) - ***Excellence prize*** | Oral | Apr., 2023 |
| 3 | Fall International Conference of Korean Society of Applied Entomology (KSAE) - ***Invited*** | Oral | Oct., 2022 |
| 4 | The 77th Annual Meeting of the Korean Association of Biological Sciences - ***Invited*** | Oral | Aug., 2022 |
| 5 | International Symposium and Annual Meeting of the KSABC – Young Scientist Presentation - ***Invited*** | Oral | June, 2022 |
| 6 | 4$^{th}$ BK21 Participating Education Group Performance Forum - Excellent Performance Presentation Competition - ***Top prize*** | Oral | Feb., 2022 |
| 7 | 4$^{th}$ BK21 program symposium - ***Top prize*** | Oral | Feb., 2022 |
| 8 | Fall International Conference of KSAE - Corteva award competition (Insecticide resistance: Mechanism and management) - ***Top prize*** | Oral | Oct., 2019 |
| 9 | The 2nd International Conference on Biological Waste as Resource 2017 (BWR2017) in Hongkong | Oral | May, 2019 |
| 10 | International Symposium and Annual Meeting of the KSABC – Graduate Student Presentation | Oral | June, 2018 |
| 11 | International Symposium and Annual Meeting of the KSABC – Graduate Student Presentation (**Excellent Paper**) | Oral | June, 2017 |

## Invited and contributed lectures

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| 1 | Theory and practice of analytical instrumentation (GC-MS and HPLC), Plant Quarantine Technology Center, Animal and Plant Quarantine Agency, Gimcheon 39660, Republic of Korea | Aug., 2022 |

## Teaching experience

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| 1 | School of Applied Biosciences, Kyungpook National University, Daegu, Republic of Korea<br>· Agricultural Food Hazardous Substances Informatics<br>· Analytical Organic Chemistry Experiment<br>· Functional Cosmetics based on Natural Product | 2022-present |
| 2 | Facilitator Workshop using Design Thinking, Design Thinking Community (DTC), Daegu, Republic of Korea | 2015-2016 |
| 3 | Youth Community Workshop for Career Exploration, Daegu, Republic of Korea | 2014-2016 |

## Journal review and Editorial service – peer reviewer

1. Journal of Asia-Pacific Entomology (Elsevier)
2. Science of The Total Environment (Elsevier)

## References

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