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EDUCATION

2021–2025 **PhD, Biological Sciences, Seoul National University**
Dissertation: *The Core Microbiome and Metabolism of the Tricholoma matsutake Holobiont*
Advisor: Young Woon Lim, Ph.D.

2019–2020 **MSc, Biological Sciences, Seoul National University**
Thesis: *Phylogenetic Relatedness Predicts Spatial Distribution of Ectomycorrhizal Fungi in the Root of Pinus densiflora Seedlings*
Advisor: Young Woon Lim, Ph.D.

2013–2018 **BSc, Life Sciences, Korea University**
Undergraduate Thesis: *Nuclear Ribosomal DNA and Plastome Evolution of the Galápagos Scalesia (Heliantheae; Asteraceae)*
Advisor: Ki-Joong Kim, Ph.D.

RESEARCH EXPERIENCE

2019–2026 **Graduate Student Researcher, Seoul National University**

2025– Phylogenomics-based re-establishment of the taxonomic system of the order Hymenochaetales (Funded by National Research Foundation, Republic of Korea)

- Optimized target-enrichment sequencing library preparation for 60+ mushroom species.

2024–2025 Development of technologies for large-scale production and utilization of microbial-derived proteins (Funded by Korea Institute of Planning and Evaluation for Technology in Food, Agriculture and Forestry, Republic of Korea)

- Isolated and preserved edible mushroom strains.
- Identified species using DNA barcoding combined with phylogenetic analysis.

2021–2023 Development of functional materials from *Tricholoma matsutake* and *Gastrodia elata* based on holobiont information (Funded by National Institute of Forest Science, Republic of Korea)

- Developed bioinformatics pipeline for clustering and taxonomic assignment of heterogeneous amplicon sequences using phylogenetic approach.
- Characterized *T. matsutake*–associated bacterial and fungal communities using culture-dependent and metabarcoding approaches.
- Identified bacterial and fungal strains enhancing *T. matsutake* mycelial growth through co-culture and filtrate assays.
- Determined nutrient utilization patterns of *T. matsutake* and associated microbes using Phenotype Microarray™ and growth curve analysis.

- Identified differentially expressed genes and enriched metabolic pathways of *T. matsutake* through RNA-seq under tailored nutrient conditions.
- Constructed genome-scale metabolic model (GEM) of *T. matsutake* using Pathway Tools to elucidate metabolic capabilities.
- Led development of three grant proposals and final reports.

2019–2023 Acquisition of potential ectomycorrhizal fungal barcode sequences from pine and oak in multiple provinces using NGS (Funded by Korea National Arboretum, Republic of Korea)

- Collected hundreds of pine and oak roots across multiple regions.
- Performed morphotyping, DNA barcoding, and metabarcoding to characterize ectomycorrhizal fungal communities.

2019–2020 Research on indigenous fungi in Mount Taebaek (Funded by National Institute of Biological Resources, Republic of Korea)

- Collected and documented hundreds of fungal specimens through field surveys.
- Isolated and preserved fungal strains obtained from wood and mushrooms.
- Identified species using DNA barcoding combined with phylogenetic analysis.
- Led the writing of final reports.

PUBLICATIONS

First author publications

- **Yoo, S.**, Seo, C. W. & Lim, Y. W. (2026). Functionally distinct core microbes of *Tricholoma matsutake* revealed by cross-study analysis. *Microbiome*. https://doi.org/10.1186/s40168-025-02329-x.
- **Yoo, S.**, Cho, Y., Park, K. H., & Lim, Y. W. (2022). Exploring Fine-Scale Assembly of Ectomycorrhizal Fungal Communities Through Phylogenetic and Spatial Distribution Analyses. *Mycorrhiza*, *32*(5), 439-449. https://doi.org/10.1007/s00572-022-01088-z.
- **Yoo, S.**, Cho, Y., Kim, J. S., Kim, M., & Lim, Y. W. (2022). Fourteen Unrecorded Species of Agaricales Underw. (Agaricomycetes, Basidiomycota) from the Republic of Korea. *Mycobiology*, *50*(4), 219–230. https://doi.org/10.1080/12298093.2022.2097364.

Co-authored publications

- Suh, H., Seo, C. W., Park, K. H., **Yoo, S.**, Kim, D., Cho, Y., & Lim, Y. W. (2026). Hidden diversity of crust-like Sebacinaceae (Sebacinales, Agaricomycetes) in Asia. *IMA Fungus*, 17, e168486.
- Lupala, A. S., Lee, Y. J., **Yoo, S.**, Choi, J., Lim, J. M., Lee, S. B., Jung, Y. H., & Lim, Y. W. (2025). Integrated Assessment of Growth and Protein Content in Basidiomycetous Fungi for Mycoprotein Production. *Journal of Microbiology and Biotechnology, 35*, e2510014.
- Seo, C. W., **Yoo, S.**, Cho, Y., Kim, J. S., Steinegger, M., Lim, Y. W. (2025). FunVIP: Fungal Validation and Identification Pipeline based on phylogenetic analysis. *Journal of Microbiology*, *63*(4), e2411017.

- Park, K. H., Oh, S. Y., Cho, Y., Seo, C. W., Kim, J. S., **Yoo, S.**, ... & Lim, Y. W. (2023). Mycorrhizal Fungal Diversity Associated with Six Understudied Ectomycorrhizal Trees in the Republic of Korea. *Journal of Microbiology*, 61(8), 729-739
- Kim, J. S., Cho, Y., Seo, C. W., Park, K. H., **Yoo, S.**, Lee, J. W., ... & Lim, Y. W. (2023). Fungal catastrophe of a specimen room: just one week is enough to eradicate traces of thousands of animals. *Journal of Microbiology*, 61(2), 189-197.
- Park, M. S., **Yoo, S.**, Cho, Y., Park, K. H., Kim, N. K., Lee, H. S., & Lim, Y. W. (2021). Investigation of the fungal diversity of the Federated States of Micronesia and the construction of an updated fungal inventory. *Mycobiology*, 49(6), 551-558.
- Park, K. H., **Yoo, S.**, Park, M. S., Kim, C. S., & Lim, Y. W. (2021). Different patterns of belowground fungal diversity along altitudinal gradients with respect to microhabitat and guild types. *Environmental microbiology reports*, *13*(5), 649–658.
- Cho, Y., **Yoo, S.**, Park, M. S., Kim, J. S., Kim, C. S., & Lim, Y. W. (2021). Ectomycorrhizal Fungi Associated with *Pinus densiflora* Seedlings under Flooding Stress. *Sustainability*, *13*(8), 4367.
- Park, K. H., Oh, S. Y., **Yoo, S.**, Fong, J. J., Kim, C. S., Jo, J. W., & Lim, Y. W. (2020). Influence of season and soil properties on fungal communities of neighboring climax forests (*Carpinus cordata* and *Fraxinus rhynchophylla*). *Frontiers in Microbiology*, 11, 572706.
- Park, K. H., Oh, S. Y., **Yoo, S.**, Park, M. S., Fong, J. J., & Lim, Y. W. (2020). Successional change of the fungal microbiome pine seedling roots inoculated with *Tricholoma matsutake*. *Frontiers in Microbiology*, 11, 574146.
- Lee, H., Park, M. S., Park, J. H., Cho, H. J., Park, K. H., **Yoo, S.**, ... & Lim, Y. W. (2020). Seventeen Unrecorded Species from Gayasan National Park in Korea. *Mycobiology*, 48(3), 184-194.

PRESENTATIONS

Oral

- **Yoo, S.**, Cho, Y., Park, K. H., & Lim, Y. W. (2023). *Exploring Fine-Scale Assembly of Ectomycorrhizal Fungal Communities Through Phylogenetic and Spatial Distribution Analyses* [Conference presentation]. Mycological Society of America Annual Meeting, Flagstaff, AZ, USA.

TEACHING EXPERIENCE

2023 Field Taxonomy Training Program for Citizen Scientists, Seoul National University & National Institute of Biological Resources

- Course: Field collection and identification of mushrooms, with an introduction to fungal ecology
- Roles: Lead TA (Lecturer), preparation of field equipment and materials, development of teaching resources, training other TAs, teaching, safety education, grading and feedback on the lab reports (citizen scientists).

2020, 2022 Practice in Biology, Seoul National University

- Course: Field collection and identification of mushrooms, with an introduction to fungal ecology

- Roles: TA (Lecturer), preparation of field equipment and materials, development of teaching resources, teaching, safety education, grading and feedback on lab reports (undergraduate students).

2020 Laboratory in Microbial Systematics, Seoul National University

- Course: Phylogenetic species identification of mushrooms: a case study of *Suillus* species
- Roles: Lead TA (Lecturer), development of teaching resources, teaching, grading and feedback on presentation and lab reports (undergraduate students).

2019, 2022 Biology Laboratory, Seoul National University

- Course: Observation of cell division, fungal staining and observation, dissection of cow eyes, and simple phylogenetic analysis using 16S rRNA genes
- Roles: Lead TA (Lecturer), preparation of laboratory equipment and materials, development of teaching resources, training colleague TAs, teaching, safety education, grading and feedback on lab reports (undergraduate students).

AWARDS AND HONORS

2019 Outstanding Teaching Assistant Award, Seoul National University

RELEVANT SKILLS

Field & Experimental Microbiology

- Environmental sampling of soil, roots, and fungal fruiting bodies.
- Morphological identification of fungi (mushrooms, ectomycorrhiza, cultured isolates).
- Isolation, cultivation, and preservation of fungal and bacterial strains.
- Microbial growth assays (monoculture, co-culture, and filtrate-based interaction experiments) and substrate utilization profiling using Phenotype MicroArray™.
- High-quality DNA/RNA extraction from environmental samples and cultured isolates.
- Optimization of NGS library preparation (fragmentation, adapter ligation, PCR, gel electrophoresis, and size selection).

Computational Biology & Quantitative Analysis

- Proficient in R and Linux (conda environments).
- Metabarcoding data processing and interpretation of bacterial and fungal communities in relation to environmental variables using MEGAN6, QIIME2, microeco, etc.
- Structural and functional annotation of fungal genome and RNA-seq analysis including differential gene expression and gene set enrichment analysis.
- Construction and interpretation of genome-scale metabolic models (GEMs) using Pathway Tools.
- DNA barcoding combined with phylogenetic analysis for fungal identification using single- and multi-gene approaches.

- Bayesian time-calibrated phylogenetic inference with fossil and molecular constraints using BEAST2.
- Multivariate, network, and spatial distribution analyses.
- Proficient in Geneious, Cytoscape, ImageJ, Inkscape, Microsoft Office, etc. for data analysis and visualization.

Languages & Scientific Communication

- English (professional proficiency), Korean (native).
- Clear and effective communication of complex scientific concepts in writing and presentations.

Additional Information

2015–2017	Mandatory Military Service, The Republic of Korea Army.
2020–2021	Lab Manager, Laboratory of Mycology and Ecophylogeny, Seoul National University.
2023–	International Driver's License.