EKKACHAI KHWANBUA

Department of Biology, University of Washington, Seattle Campus
Life Sciences Building, 3747 W Stevens Way NE, Seattle, WA 98195, USA
(515) 441-4126, ekhwan@uw.edu, ORCID: 0009-0007-4013-941X

EDUCATION

DOCTOR OF PHILOSOPHY, PLANT PATHOLOGY Jan 2021 – Dec 2025
MINOR IN GENETICS AND GENOMICS
Iowa State University (ISU) Ames, Iowa, USA

- Major professor: Dr. Steven A. Whitham
- Dissertation title: Plant immune responses to elevated carbon dioxide and implications for crop health in a changing climate

BACHELOR OF AGRICULTURE SCIENCE (*Summa cum laude*) Aug 2016 – May 2019
Kasetsart University (KU) Bangkok, Thailand

- Major professor: Dr. Tiyakhon Chatnaparat
- Thesis title: Investigation of small molecules that inhibit the type III secretion system in *Xanthomonas citri* pv. *glycines*

RESEARCH EXPERIENCE & POSITIONS

POSTDOCTORAL SCHOLAR May 2026 – Present
University of Washington (UW) Seattle, Washington, USA
Supervisor: Dr. Adam Steinbrenner

POSTDOC RESEARCH ASSOCIATE Jan 2026 – April 2026
Iowa State University (ISU) Ames, Iowa, USA
Supervisor: Dr. Steven A. Whitham
My postdoc research focuses on CRISPR gene editing and virus-induced genome engineering in maize and soybean to study and enhance disease resistance.

GRADUATE RESEARCH ASSISTANT Jan 2021 – Dec 2025
Iowa State University (ISU) Ames, Iowa, USA
My PhD research addresses how climate changes shape plant-microbe interactions, and focuses on developing strategies that harness plant viruses for plant genome engineering.

UNDERGRADUATE RESEARCH ASSISTANT Aug 2017 – May 2019
Kasetsart University (KU) Bangkok, Thailand
I identified two putative type III secretion system (T3SS) inhibitors suppressing the expression of representative T3SS genes in *Xanthomonas citri* pv. *glycines* without affecting bacterial survival.

UNDERGRADUATE RESEARCH FELLOW Fall 2017
Hiroshima University (HU) Hiroshima, Japan
I conducted a small project to isolate different soil-borne pathogens antagonistic to *Fusarium virguliforme*.

UNDERGRADUATE INTERN Summer 2017
Department of Agriculture (DOA) Bangkok, Thailand
I diagnosed plant diseases and developed biocontrol products to help mitigate crop losses.

UNDERGRADUATE INTERN Summer 2016
Kasetsart University Research and Development Institute (KURDI) Bangkok, Thailand
I studied plant-pathogen interactions using tissue culture to observe cellular changes in plants during pathogen infection.

INDUSTRY COLLABORATION

INDUSTRY RESEARCH COLLABORATION 2024 – 2026
Corteva Agriscience Johnston, Iowa
I collaborated with scientists to develop and implement Cas12f1-based and virus-mediated CRISPR gene editing platforms for functional genomics studies and trait improvement, including experimental design, execution of experiments, and data collection.

PUBLICATIONS

PEER-REVIEWD JOURNAL ARTICLES ([†]co-first author) ([§]undergraduate mentee) ([#]graduate mentee)

[3] Bredow, M.[†], **Khwanbua, E.[†]**, Chicowski, A.S.[†], Qi, Y., Breitzman, M.W., Holan, K., Liu, P., Graham, M.A., and Whitham, S.A. (2025) Elevated CO_2 alters soybean physiology and defense responses, and has disparate effects on susceptibility to diverse microbial pathogens. *New Phytol*. doi.org/10.1111/nph.20364
See also the commentary on this article by Sanchez-Lucas & Luna, 246: 2380–2383.

[2] Mejias, J., Margets, A., Bredow, M., Foster, J., **Khwanbua, E.**, Goshon, J., Maier T.R., Whitham, S.A., Innes, R.W., and Baum, T.J. (2025) A novel toolbox of GATEWAY-compatible vectors for rapid functional gene analysis in soybean composite plants. *Plant Cell Rep*. doi.org/10.1007/s00299-025-03458-1

[1] Pluemjit, N., Sripo-Ngam, S., **Khwanbua, E.**, and Chatnaparat, T. (2020) Role of amino acid cysteine in the suppression of *Xanthomonas citri* pv. *glycines* bacterial pustule disease of soybean. *CMU J. Nat. Sci*. doi.org/10.12982/CMUJNS.2020.0052

PREPRINT ON BIORXIV

[3] **Khwanbua, E.**, Lappe, R.R., Bierl, A.A.[§], and Whitham, S.A. (2026) Turnip mosaic virus-based gRNA delivery system for plant genome editing. *bioRxiv*. doi.org/10.64898/2026.04.22.720221

[2] Mejias, J., Bredow, M., Kumar, A., Juvale, P.S., Maier, T.M., **Khwanbua, E.**, Whitham, S.A., Eves-van den Akker, S., and Baum, T.J. (2026) The sugar-beet cyst nematode effector *Hs*2B11 targets the Arabidopsis serine protease inhibitor *At*PR-6 to favor parasitism. *bioRxiv*. doi.org/10.64898/2026.02.21.707195

[1] **Khwanbua, E.**, Ssengo, J., Qi, Y., Liu, P., Graham, M.A., and Whitham, S.A. (2026) Effects of atmospheric CO_2 levels on the susceptibility of maize to diverse pathogens. *bioRxiv*. doi.org/10.64898/2025.12.31.697224

MANUSCRIPTS UNDER REVIEW

[1] Haewou, N.[#], **Khwanbua, E.**, Khaengraeng, C., Kuncharoen, N., Kasem, S., and Chatnaparat, T. (2026) Compartment-specific bacterial communities in turmeric and their association with suppression of *Ralstonia pseudosolanacearum*. *Phytopathology*. Under review.

MANUSCRIPTS IN PREPARATION

[3] Haewou, N.[#,†], **Khwanbua, E.†**, Niamtaeng, T., Khaengraeng, C., and Chatnaparat, T. Genome-based characterization of *Pseudomonas anuradhapurensis* KnCo4 with insights into osmoadaptation and plant-associated functions. *Manuscript in preparation.*

[2] Anyong, T. [#,†], **Khwanbua, E.†**, Kongkaew, J., Kuncharoen, N., Piasai, O., Kasem, S., and Leesutthiphonchai, W. *Phytophthora phyllosphaerae* sp. nov., a novel oomycete species associated with orchid black rot. *Manuscript in preparation.*

[1] **Khwanbua, E.** and Whitham, S.A. Plant immune responses to rising carbon dioxide. *Review article in preparation.*

POSTER PRESENTATION

Khwanbua, E., Ssengo, J., Qi, Y., Liu, P., Graham, M. A., and Whitham, S.A. (2025) Maize-pathogen interactions in elevated carbon dioxide. IS-MPMI congress, Cologne, Germany.

Khwanbua, E. [†], Bredow, M. [†], Chicowski, A.S. [†], Qi, Y., Breitzman, M.W., Holan, K., Liu, P., Graham, M. A., and Whitham, S.A. (2024) Elevated CO_2 alters soybean physiology and defense responses, and has disparate effects on susceptibility to diverse microbial pathogens. Iowa Soybean Research Center (ISRC), Ames, Iowa, USA.

Khwanbua, E., Lappe, R. R., and Whitham S.A. (2023) Turnip mosaic virus-based gRNA delivery system for plant genome editing. IS-MPMI Congress, Providence, Rhode Island, USA.

Khwanbua, E. [†], Bredow, M. [†], Chicowski, A.S. [†], Holan, K., and Whitham, S.A. (2022) Toward understanding the effects of elevated CO_2 on soybean physiology and disease interactions. Plant Health, Pittsburgh, Pennsylvania, USA.

Khwanbua, E., Elmore, M.G., Groves, C., Hajimorad, M.R., Stewart, T., Gaskill, M., Smith, D., Mueller, D., and Whitham, S.A. (2022) Discovery of clover yellow vein virus in Iowa soybean fields in 2016 and 2017. The Eleventh Biennial All-Iowa Symposium, Ames, Iowa, USA.

Khwanbua, E. and Chatnaparat, T. (2019) Roles of molecules for inhibiting type III secretion system in *Xanthomonas citri* pv. *glycines* causing bacterial pustule of soybean. The International Conference on the 8th Kasetsart University Symposium, Bangkok, Thailand. (First Prize)

RESEARCH PRESENTATION

Khwanbua, E., Qi, Y., Ssengo, J., Liu, P., Graham, M. A., and Whitham, S.A. (2026) Crop-pathogen interactions under rising atmospheric carbon dioxide. Invited seminar, University of Washington, Seattle, USA.

Khwanbua, E., Qi, Y., Ssengo, J., Liu, P., Graham, M. A., and Whitham, S.A. (2025) C3 and C4 crops in a changing climate: physiological and immune responses to rising CO_2. Exit Seminar, Ames, Iowa, USA.

Khwanbua, E.[§], Bredow, M.[§], Chicowski, A.S.[§], Qi, Y., Breitzman, M.W., Holan, K., Liu, P., Graham, M. A., and Whitham, S.A. (2025) High CO_2, high stakes: the tug-of-war between plant growth and immunity. Special Seminar, Kasetsart University, Bangkok, Thailand.

Khwanbua, E., Lappe, R. R., and Whitham S.A. (2025) Development of a potyvirus-based gRNA delivery system for plant genome editing. Crop Bioengineering Center Seminar, Ames, Iowa, USA.

Khwanbua, E., Ssengo, J., Qi, Y., Liu, P., Graham, M. A., and Whitham, S.A. (2025) Assessing the impacts of elevated CO_2 on maize physiology, defense responses, and disease susceptibility. Genetics of Maize-Microbe Interactions Seminar, Ames, Iowa, USA.

TEACHING EXPERIENCE

GRADUATE TEACHING ASSISTANT Fall 2024 – Fall 2025
Iowa State University (ISU) Iowa, USA
I prepared, planned, and co-taught lab sections for the undergraduate course, Principles of Plant Pathology (PLP408), which had approximately 30 students. I mentored and encouraged students to build an understanding of the biology and ecology of plant pathogens and the diseases they cause in order to develop sustainable strategies for the management of plant diseases and think critically about issues, policies, and practices associated with plant diseases and integrated pest management.

GUEST LECTURER Spring 2023 & Spring 2024
Kasetsart University (KU) Bangkok, Thailand
I provided a single lecture to each of two online graduate courses, Advanced Bacterial Diseases of Plants (01008511) and Advanced Plant Pathology I (01008561), each with approximately 10 students. I led discussions on the evolutionary arms race between plants and pathogens and covered how abiotic stresses affect plant growth, development, and plant-microbe interactions.

MENTORING ACTIVITIES

UNDERGRADUATE STUDENTS
LORETTA OSTERMEIER Spring 2026
I mentored research investigating plant physiological and disease responses across a controlled CO_2 gradient experiment.

AUSTIN BIERL Fall 2025 – Spring 2026
I mentored through the virus-induced gene editing project and plant responses across a controlled CO_2 gradient.

RENEE PLASSMAN Fall 2023 – Fall 2024
I mentored through the soybean CRISPR/Cas9 knockout project and taught how to use a scanning electron microscope.

OLIVIA JOHNSON Fall 2023
I mentored through the soybean CRISPR knockout project.

GRADUATE STUDENTS

LUKE HUGGINS Fall 2025 – Spring 2026
Doctoral student from Iowa State University, USA
I mentored through a project investigating viral infection and plant physiological responses under elevated CO_2 and drought stress.

SAMARA A. CARDOSO Spring 2024
Doctoral student from University of São Paulo, Brazil
I mentored through the virus-induced gene silencing in maize project.

THARIKA MAHATHANTHRIGE Spring 2024
Doctoral student from Queen's University, Canada
I mentored through the virus-induced gene silencing in soybean project.

PROFESSIONAL DEVELOPMENT

PREPARING FUTURE FACULTY (PFF) (GRST 5850: Preparing Future Faculty Introductory, Seminar, GRST 5870: Preparing Future Faculty Teaching Practicum**,** and GRST 5880: Preparing Future Faculty Special Topics) is a selective program. For GRST 5850, I developed job application materials for faculty positions and gained a better understanding of faculty life challenges, including job searches, tenure expectations, position responsibilities, and work-life balance. For GRST 5870, I gained more teaching experience and learned how to write a syllabus, choose different teaching styles, approach students, and develop a teaching portfolio. For GRST 5880, an in-depth study of a topic associated with academic professional development, I wrote a review paper to expand my knowledge, consolidate ideas, and reflect on the work of others.

HONORS & AWARDS

Research Excellence Award, Iowa State University	2025
Preparing Future Faculty Associate, Iowa State University	2025
PPEM Graduate Travel Award (Zirakparvar funds), Iowa State University	2025
International Society for Molecular Plant-Microbe Interactions Shimamoto Travel Award	2023
PPEM Graduate Travel Award, Iowa State University	2023
Zirakparvar Newsletter Fellowship, Iowa State University	2023
PPEM Graduate Travel Award, Iowa State University	2022
Doctoral Fellowship from Anandamahidol (King Scholarship), Thailand	2021 – 2025
Full-Semester Support from Japan Student Services Organization Scholarship, Japan	2017
Outstanding Undergraduate Student, Kasetsart University, Thailand	2017 – 2019

Outstanding Undergraduate Student, Department of Plant Pathology, Thailand 2016

Community Outreach & Volunteering

Mentor high school students participating in the Science Bound program	2024 – 2025
Zirakparvar Newsletter Fellow	2023
Vice President of the Plant Pathology Graduate Student Organization	2022
Volunteer at the "Iowa Master Gardener Program"	2022

Affiliations & Memberships

International Society for Molecular Plant-Microbe Interactions (IS-MPMI)
American Society of Plant Biologists (ASPB)
American Phytopathological Society (APS)
Thai Student Organization (TSA) at Iowa State University

References

- **ADAM STEINBRENNER** (POSTDOC SUPERVISOR)
  Associate Professor
  University of Washington, Seattle
  Department of Biology
  Email: astein10@uw.edu
  Phone: 610-389-9690

- **STEVEN A. WHITHAM** (MAJOR PROFESSOR)
  Professor
  Iowa State University
  Department of Plant Pathology, Entomology and Microbiology
  Email: swhitham@iastate.edu
  Phone: 515-294-4952

- **MICHELLE GRAHAM** (RESEARCH COLLABORATOR)
  USDA-ARS, CICGRU
  Department of Agronomy
  Iowa State University
  Email: michelle.graham@usda.gov, magraham@iastate.edu
  Phone: 515-294-3626

- **GWYN A. BEATTIE** (PFF MENTOR)
  Robert Earle Buchanan Distinguished Professor of Bacteriology
  Iowa State University
  Department of Plant Pathology, Entomology and Microbiology
  Email: gbeattie@iastate.edu
  Phone: 515-294-5571

- **NICHOLAS T. PETERS** (PFF MENTOR)
  Associate Professor
  Iowa State University
  Department of Plant Pathology, Entomology and Microbiology
  Email: ntpeters@iastate.edu
  Phone: 515-520-2885