

Zhi-Yan (Rock) Du
College of Tropical Agriculture and Human Resources
Department of Molecular Biosciences & BioEngineering
FTE Distribution: 40% I; 60% R; 0% E

Education

<u>Degree</u>	<u>University</u>	<u>Major</u>
Bachelors	Beijing Forestry University	Biological Sciences
Masters	Institute of Botany, Chinese Academy of Sciences	Evolutionary Developmental Biology
PhD	The University of Hong Kong	Biochemistry & Molecular Biology

Professional Appointments

<u>Title</u>	<u>Employer</u>	<u>Dates Employed</u>
Assistant Professor (tenure-track)	Department of Molecular Biosciences & BioEngineering, UHM	2020.8 - present
Assistant Professor (fixed-term)	Department of Biochemistry & Molecular Biology, Michigan State University	2018-2020
Research Associate	US Department of Energy-MSU Plant Research Laboratory, Michigan State University	2013 - 2018
Research Assistant	Plant Molecular Biology and Biochemistry, School of Biological Sciences, The University of Hong Kong	2011 - 2013

Courses Taught

Course ID and name (credits)

MBBE/BIOL 401 Molecular Biotechnology (3 cr, Spring)
MBBE/BIOL 401L Molecular Biotechnology Lab - Gene Editing by CRISPR (2 cr, Spring)
MBBE 691 Advanced Special Topics in MBBE (guest speaker, 1 cr, Fall)

Publications (reverse chronological order)

Books

1. **Du, Z.**, Bhat, W., Kai, G., Yu, X., Zienkiewicz, A., Zienkiewicz, K. 2023. Metabolic engineering of valuable compounds in photosynthetic organisms. Frontiers Media SA. 2023.
2. **Du, Z.**, Hoffmann-Benning, S., Zienkiewicz, A., Zienkiewicz, K., Wang, S., Yin, L. Lipid Metabolism in Development and Environmental Stress Tolerance for Engineering Agronomic Traits. Frontiers Media SA. 2021.

Book Chapters

1. Zhu, S., Bonito, G., Chen, Y., and **Du, Z.*** 2020. Oleaginous Fungi in Biorefineries. In “Reference Module in Life Sciences” (ISBN 9780128096338), DOI: 10.1016/B978-0-12-819990-9.00004-4.
2. **Du, Z.**, and Benning, C. 2016. Triacylglycerol accumulation in photosynthetic cells in plants and algae. In “Lipids in plant and algae development” (ISBN 9783319259796), edited by Nakamura, Y. and Li-Beisson Y. Springer. 179-205.

Book Reviews

Du, Z. Handbook of Algal Science, Technology and Medicine. Edited by Ozcan Konur. Academic Press. Amsterdam (The Netherlands) and New York: Elsevier. ISBN: 978-0-12-818305-2. 2020.

Selected Journal Publications

1. **Du, Z.***, Bhat, W., Poliner, E., Johnson, S., Bertucci, C., Farre, E., Hamberger, B.* 2023. Engineering *Nannochloropsis oceanica* for the scalable production of diterpenoid compounds. Mlife, accepted.
2. Xie, J., Zhou, X., Jia, Z., Su, C., Zhang, Y., Fernie, A., Zhang, J.*, **Du, Z.***, Chen, M.* Alternative Splicing, An Overlooked Defense Frontier of Plants with Respect to Bacterial Infection. Journal of Agricultural and Food Chemistry, DOI: 10.1021/acs.jafc.3c04163.
3. Shitanaka, T., Fujioka, H., Khan, M., Kaur, M., **Du, Z.***, Khanal, S.* 2023. Recent advances in microalgal production, harvesting, prediction, optimization, and control strategies. Bioresource Technology, 129924.
4. Li, Y., Yang, Y., Li, P., Sheng, M., Li, L., Ma, X., **Du, Z.**, Tang, K., Hao, X., Kai, G. 2023. AaABI5 transcription factor mediates light and abscisic acid signaling to promote anti-malarial drug artemisinin biosynthesis in *Artemisia annua*. International Journal of Biological Macromolecules, 253: 127345.
5. **Du, Z.***, Bhat, W., Kai, G., Yu, X., Zienkiewicz, A., Zienkiewicz, K. 2023. Metabolic engineering of valuable compounds in photosynthetic organisms. Frontiers in Plant Science, 14: 1260454.
6. Shitanaka, T., Higa, L., Bryson, A., Bertucci, C., Vande Pol, N., Lucker, B., Khanal, S. Bonito, G., **Du, Z.*** 2023. Flocculation of oleaginous green algae with *Mortierella alpina* fungi. Bioresource Technology, 129391.
7. **Du, Z.***, Qu, Y., Liu, Z., Gaid, M. 2023. Advances in metabolism and chemodiversity-focus-plant enzymes. Frontiers in Plant Science, 14: 1227424.
8. Rennick, B., Benucci, G., **Du, Z.**, Healy, R., Bonito, G. 2023. *Tuber rugosum*, a new species from northeastern North America: Slug mycophagy aides in electron microscopy of ascospores. Mycologia, <https://doi.org/10.1080/00275514.2023.2184983>.
9. Zhu, S., Higa, L., Barela, A., Lee, C., Chen, Y., **Du, Z.*** 2023. Microalgal Consortia for Waste Treatment and Valuable Bioproducts. Energies 16: 884.
10. **Du, Z.***, Hoffmann-Benning, S., Zienkiewicz, A., Zienkiewicz, K., Wang, S., Yin, L. 2021. Editorial: Lipid Metabolism in Development and Environmental Stress Tolerance for Engineering Agronomic Traits. Frontiers in Plant Science, DOI: 10.3389/fpls.2021.739786.
11. Shi, M., **Du, Z.**, Hua, Q., and Kai, G. 2021. CRISPR/Cas9-mediated targeted mutagenesis of bZIP2 in *Salvia miltiorrhiza* leads to promoted phenolic acid biosynthesis. Industrial Crops and Products 164: 113560.
12. Zhou, W., Li, S., Maoz, I., Wang, Q., Xu, M., Feng, Y., Hao, X., **Du, Z.***, and Kai G. 2021. SmJRB1 positively regulates the accumulation of phenolic acid in *Salvia miltiorrhiza*. Industrial Crops and Products 164: 113417.

13. Guo, Z., Pogancev, G., Meng, W., **Du, Z.**, Liao, P., Zhang, R., Chye, M. 2020. The overexpression of rice ACYL-COA-BINDING PROTEIN4 improves salinity tolerance in transgenic rice. *Environmental and Experimental Botany*, 104349.
14. Meng, W., Xu, L., **Du, Z.**, Wang, F., Zhang, R., Song, X., Lam, S., Shui, G., Li, Y., and Chye, M. 2020. RICE ACYL-COA-BINDING PROTEIN6 affects acyl-CoA homeostasis and growth in rice. *Rice*, 13: 75.
15. Aznar-Moreno, J., Venegas-Calderón, M., **Du, Z.**, Garcés, R., Tanner, J., and Chye, M., Martínez-Force, E., Salas, J. 2020. Characterization and function of a sunflower (*Helianthus annuus* L.) Class II acyl-CoA-binding protein. *Plant Science*, 300: 110630.
16. Liber, J., Bryson, A., Bonito, G., and **Du, Z.*** 2020. Harvesting Microalgae for Food and Energy Products. *Small Methods*, 2000349.
17. Zienkiewicz, A., Zienkiewicz, K., Poliner, E., Pulman, J., **Du, Z.**, et al. 2020. The microalga *Nannochloropsis* during transition from quiescence to autotrophy in response to nitrogen availability. *Plant Physiology*, 182:819-839.
18. **Du, Z.**, Zienkiewicz, K., Vande Pol, N., Ostrom, N., Benning, C., and Bonito, C. Algal-fungal symbiosis leads to a photosynthetic mycelium. *eLife*, 2019;8:e47815.
19. O'Donnell, D., **Du, Z.**, Litchman, E. 2019. Experimental evolution of phytoplankton fatty acid thermal reaction norms. *Evolutionary Applications*, <https://doi.org/10.1111/eva.12798>.
20. **Du, Z.**, Alvaro, J., Hyden, B., Zienkiewicz, K., Benning, N., Zienkiewicz, A., Bonito, C., and Benning, C. 2018. Enhancing oil production and harvest by combining the marine alga *Nannochloropsis oceanica* and the oleaginous fungus *Mortierella elongata*. *Biotechnology for Biofuels*, 11: 174.
21. Poliner, E., Takeuchi, T., **Du, Z.**, Benning, C., Farré, E. 2018. Non-transgenic marker-free gene disruption by an episomal CRISPR system in the oleaginous microalga, *Nannochloropsis oceanica* CCMP1779. *ACS Synthetic Biology*, 7: 962-968.
22. **Du, Z.**, Lucker, B., Zienkiewicz, K., Millera, T., Zienkiewicz, A., Sears, B., Kramer, D., and Benning, C. 2018. Galactoglycerolipid Lipase PGD1 Is Involved in Thylakoid Membrane Remodeling in Response to Adverse Environmental Conditions in *Chlamydomonas*. *The Plant Cell*, 30: 447-465.
23. Zienkiewicz, K., Zienkiewicz, A., Poliner, E., **Du, Z.**, Vollheyde, K., Herrfurth, C., Marmon, S., Farré, E., Feussner, I., and Benning, C. 2017. *Nannochloropsis*, a rich source of diacylglycerol acyltransferases for engineering of triacylglycerol content in different hosts. *Biotechnology for Biofuels*, 10: 8.
24. Uehling, J., Gryganskyi, A., Hameed, K., Tschaplinski, T., Misztal, P., Wu, S., Desirò, A., Vande Pol, N., **Du, Z.** et al. 2017. Comparative genomics of *Mortierella elongata* and its bacterial endosymbiont *Mycoavidus cysteinexigens*. *Environmental Microbiology*, 19: 2964-2983.
25. Zienkiewicz, K., **Du, Z.**, Ma W., and Benning, C. 2016. Neutral lipid biosynthesis in microalgae - molecular, cellular and physiological insight. *Biochimica et Biophysica Acta*, 1816: 1269-1281.
26. **Du, Z.**, Arias, T., Meng, W., and Chye, M. 2016. Plant acyl-CoA-binding proteins: An emerging family involved in plant development and stress responses. *Progress in Lipid Research*, 63: 165-181.
27. **Du, Z.**, Chen, M., Chen, Q., Gu, J., and Chye, M. 2015. Expression of Arabidopsis acyl-CoA-binding proteins AtACBP1 and AtACBP4 confers Pb(II) accumulation in *Brassica juncea* roots. *Plant, Cell & Environment*, 38: 101-117.
28. **Du, Z.**, Chen, M., Chen, Q., Xiao, S., and Chye, M. 2013a. Arabidopsis Acyl-CoA-Binding Protein ACBP1 participates in the regulation of seed germination and seedling development. *The Plant Journal*, 74: 294-309.
29. **Du, Z.**, Chen, M., Chen, Q., Xiao, S., and Chye, M. 2013b. Overexpression of Arabidopsis Acyl-CoA-Binding Protein ACBP2 enhances drought tolerance. *Plant, Cell & Environment*, 36: 300-314.
30. **Du, Z.**, and Chye, M. 2013c. Interactions between Arabidopsis acyl-CoA-binding proteins and protein partners. *Planta*, 238: 239-245.

31. **Du, Z.**, Xiao, S., Chen, Q., and Chye, M. 2010a. Arabidopsis acyl-CoA-binding proteins ACBP1 and ACBP2 show different roles in freezing stress. *Plant Signaling & Behaviour*, 5: 607-609.
32. **Du, Z.**, Xiao, S., Chen, Q., and Chye, M. 2010b. Depletion of the membrane-associated acyl-CoA-binding protein ACBP1 confers freezing tolerance in Arabidopsis. *Plant Physiology*, 152: 1585-1597.
33. **Du, Z.**, and Wang, Y. 2008. Significance of RT-PCR expression patterns of *CYC*-like genes in *Oreocharis benthamii* (Gesneriaceae). *J. Syst. Evol.* 46: 23-31.

Patents

1. Bonito, G., **Du, Z.**, Benning, C. US Patent 10858687. Lipid biosynthesis and abiotic stress resilience in photosynthetic organisms.
2. Chye, M., **Du, Z.**, Chen, Q. WO/2013/064119. Methods using acyl-coenzyme a-binding proteins to enhance drought tolerance in genetically modified plants.
3. Chye, M., **Du, Z.**, Chen, Q. EP Patent EP2773765A4. Methods using acyl-coenzyme a-binding proteins to enhance drought tolerance in genetically modified plants.
4. Chye, M., **Du, Z.**, Chen, Q. CA Patent CA2854069C. Methods using acyl-coenzyme a-binding proteins to enhance drought tolerance in genetically modified plants.
5. Chye, M., **Du, Z.**, Chen, Q. CN Patent CN104080915B. Methods using acyl-coenzyme a-binding proteins to enhance drought tolerance in genetically modified plants.

Creative Works (i.e., Extension Videos, Websites, Blogs, Creative Designs and Exhibitions, etc.)

<https://dulab.bio>

<https://www.youtube.com/watch?v=AoFZZtYIRYc>

Leadership Roles (Committees, Boards, Advisory, etc.)

Associate editor, *Advanced Biotechnology*.

Associate editor, *Frontiers in Plant Science*.

Associate editor, *Frontiers in Bioengineering and Biotechnology*.

Panelist, USDA National Institute of Food and Agriculture

Advisory board member, AntiAlias Ventures (<https://theantialias.com/>).

Graduate Students

<u>Category</u>	<u>Current Number of Students</u>	<u>Number Finished/Graduated</u>
Member of MS and PhD Committees	6	2
PhD students	1	1
MS students	5	1

Grant Support

Active grants

Title of Grant: RII Track-2 FEC: Genome Engineering to Sustain Crop Improvement (GETSCI)

Source of Grant: NSF

Total Dollar Value (Your share of the grant value): \$3,993,756 (\$549,086)

Dates of Grant: 10/01/2021-09/30/2025

Role: Co-PI

Title of Grant: USDA-HEC: Education of Novel CRISPR Technologies for Hawaii Undergraduate and Graduate Students

Source of Grant: USDA

Total Dollar Value (Your share of the grant value): \$149,000

Dates of Grant: 1/1/23-12/31/25

Role: PI

Title of Grant: Developing affordable and efficient photobioreactor and biofiltration systems with fungal filters to grow and harvest microalgae

Source of Grant: USDA

Total Dollar Value (Your share of the grant value): \$99,790.75

Dates of Grant: 8/1/23-7/31/25

Role: PI

Title of Grant: Synthetic Bioengineering of Tropical Microalgae for the Production of High-Value Bioproducts

Source of Grant: USDA (Startup)

Total Dollar Value (Your share of the grant value): \$60,000

Dates of Grant: 06/24/2023-06/23/2025

Role: PI

Title of Grant: Random mutagenesis breeding of zooxanthellae for better stress resilience

Source of Grant: Zymo Research Corporation-Molecular Wildlife and Ecology Grant

Total Dollar Value (Your share of the grant value): \$1,000

Dates of Grant: 06/24/2023-06/23/2025

Role: PI

Completed grants

Title of Grant: Synthetic Bioengineering of Tropical Microalgae for the Production of High-Value Bioproducts

Source of Grant: USDA (Startup)

Total Dollar Value (Your share of the grant value): \$120,000

Dates of Grant: 04/16/2021-07/31/2023

Role: PI

Title of Grant: Developing a Biofiltration System with Fungal Filters for Sustainable and Economical Harvesting of Microalgae

Source of Grant: USDA

Total Dollar Value (Your share of the grant value): \$47,969

Dates of Grant: 08/1/2022-07/31/2023

Role: PI

Recent presentations at Conferences

Title: Co-production of valuable compounds with algae-fungi symbiotic systems

Authors (put an asterisk on the presenter): Zhi-Yan Du

Name of Conference: Molecular Biosciences Seminar

Location: UH Manoa

Date of Presentation: Sep 5, 2023

Title: Flocculation of oleaginous green algae with *Mortierella* fungi

Authors (put an asterisk on the presenter): Zhi-Yan Du

Name of Conference: The 62st annual meeting of the Phytochemical Society of North America (PSNA), Michigan, Jul 16 - 20, 2023

Location: Michigan State University,
East Lansing, Michigan

Date of Presentation: Section chair,
June 16; Presentation, June 17,
2023

Title: Engineering *Nannochloropsis oceanica* for the scalable production of diterpenoid compounds

Authors (put an asterisk on the presenter): Zhi-Yan Du

Name of Conference: International Conference on Algal Biomass, Biofuels and Bioproducts, Hawaii Island, June 12-14, 2023

Location: Hawaii Island

Date of Presentation: June 12, 2023

Title: Co-production of high-value biomaterials using algae-fungi symbiotic systems

Authors (put an asterisk on the presenter): Zhi-Yan Du

Name of Conference: International Conference on Plant productivity and food safety:

Soil science, Microbiology, Agricultural Genetics and Food quality, Poland, Sep 15-16, 2022

Location: Online

Date of Presentation: Sep 16, 2022

Title: Co-production of valuable compounds with algae-fungi symbiotic systems

Authors (put an asterisk on the presenter): Zhi-Yan Du

Name of Conference: Microbiology Seminar Series, UH Manoa, Sep 12, 2022

Location: WEB 113, UH Manoa

Date of Presentation: Sep 12, 2022

Title: Co-production of valuable compounds with algae-fungi symbiotic systems

Authors (put an asterisk on the presenter): Zhi-Yan Du

Name of Conference: The 61st annual meeting of the Phytochemical Society of North America (PSNA), Blacksburg, VA, Jul 24-28, 2022

Location: Virginia Tech, Blacksburg, VA

Date of Presentation: Jul 26, 2022

Title: New oil production system powered by a community of algae and fungi

Authors (put an asterisk on the presenter): Zhi-Yan Du

Name of Conference: Annual Meeting of The Multistate Research Project, S1075 USDA, Houston, TX, Jul 15-16, 2022

Location: Houston, TX

Date of Presentation: Jul 15, 2022

Title: Algal-fungal symbiosis leads to photosynthetic mycelium

Authors (put an asterisk on the presenter): Zhi-Yan Du*, Christoph Benning, Gregory Bonito

Name of Conference: Algal BBB 2021 - The International Conference on Algal Biomass, Biofuels and Bioproducts, Jun 12-14, 2021

Location: Online, Live & On-Demand

Date of Presentation: Jun 14, 2021

Title: Function and biosynthesis of lipids in microalgae

Authors (put an asterisk on the presenter): Zhi-Yan Du

Name of Conference: 2021 Symposium of natural product biotechnology, Hong Zhou, China, Jan 18, 2021

Location: Online

Date of Presentation: Jan 18, 2021