

# Jiaxu Wu

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## Summary

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How to enhance crop yield in the face of climate change and a growing population is an important topic in plant science. I am a Ph.D candidate that conduct graduate research in plant disease resistance - focusing on understanding the clubroot resistance in canola through a multidisciplinary approach that encompasses genetics, biochemistry, and bioinformatics. Our primary objective is to assist the Canadian canola industry in effectively managing clubroot disease while maintaining sustainability.

I am a highly enthusiastic, self-motivated, and cooperative team player with a strong focus on research, excellent written and oral communication, computer skills, and ability to work under tight deadlines. Being nice with all the surrounding people at every step of my life.

## Education

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### PhD student

2022-present

Plant Biology,

Faculté des Sciences de L'agriculture et de L'alimentation, Université Laval, QC, Canada

**Courses:** Analysis of Genomic Information: from Genome to Phenome, Experimental Devices

**Research topic:** Understanding the clubroot resistance mechanisms in Canola (*Brassica napus* L.)

**Funding:** Bourses de formation au doctorat, Fonds de recherche du Québec, QC, Canada

### Master of Science (MSc Thesis-based)

2019-2022

Boreal Ecosystem and Agricultural Sciences (BEAS)

School of Science of the Environment, Memorial University of Newfoundland, NL, Canada

**GPA:** 4.0/4.0

**Courses:** Graduate Research Seminar, Advanced Quantitative Research Methods for the Natural Sciences, Management of Crop Nutrition, Issues in Boreal Ecosystems and Agricultural Sciences

**Research thesis:** "Evaluating role of phosphatidic acid in cold stress tolerance in silage-corn."

**Funding:** SGS Scholarship and Research Grant, Memorial University, NL, Canada

### Bachelor of Science (BSc)

2014-2018

Horticulture

Henan University of Science and Technology, Luoyang, Henan, China

**GPA:** 4.1/5.0

**Courses:** Plant Physiology, Genetics, Agricultural Meteorology, Fertilizer Science, Horticultural Plant Cultivation, Horticultural Plants Breeding, Biochemistry, and Biotechnology, etc.

**Research topic:** "Effects of Interaction between Arbuscular Mycorrhizal and Phoxim on Growth of Chinese Chive (*Allium tuberosum* Rottl. ex Spreng.)"

## Publications

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- Nadeem, M\*, Thomas, R\*, Adigun, O., Manful, C., **Wu, J.**, Pham, T.H., Zhu, X., Galagedara, L. and Cheema, M\*. (2020), Root membrane lipids as potential biomarkers to discriminate silage-corn genotypes cultivated on podzolic soils in boreal climate. *Physiologia Plantarum* <https://doi.org/10.1111/ppl.13181>

- **Wu, J\***, Nadeem, M., Galagedara, L., Thomas, R., & Cheema, M. (2022). Recent insights into cell responses to cold stress in plants: Signaling, defence, and potential functions of phosphatidic acid. *Environmental and Experimental Botany*, 105068. <https://doi.org/10.1016/j.envexpbot.2022.105068>
- **Wu, J\***, Nadeem, M., Galagedara, L., Thomas, R., and Cheema, M. (2022). Effects of Chilling Stress on Morphological, Physiological, and Biochemical Attributes of Silage Corn Genotypes during Seedling Establishment. *Plants*, 11(9), 1217. <https://doi.org/10.3390/plants11091217>
- Nadeem, M\*, **Wu, J.**, Ghaffari H., Kadir, A J., Saleem, S., Mollier, A., Singh, J. and Cheema, M\*. (2022), Understanding the adaptive mechanisms of plants to enhance phosphorus use efficiency on podzolic soils in boreal agroecosystem. *Frontiers in Plant Science*, <https://doi.org/10.3389/fpls.2022.804058>
- Javed, M.A., Schwelm, A., Zamani-Noor, N., Salih, R., Silvestre Vañó, M., **Wu, J.** et al. (2023) The clubroot pathogen *Plasmodiophora brassicae*: A profile update. *Molecular Plant Pathology*, 24, 89– 106. <https://doi.org/10.1111/mpp.13283>
- **Wu, J.**, Pérez-López, E\*. (2023). A multilayer strategy is needed to uncover the clubroot pathogen mysteries. *Physiological and Molecular Plant Pathology*, 101971. <https://doi.org/10.1016/j.pmp.2023.101971>
- **Wu, J\***, Nadeem, M., Galagedara, L., Thomas, R and Cheema, M\*. Lipidomics remodelling: a strategy to enhance cold stress tolerance in silage corn. *Scientific Reports* (Submitted, under review)
- **Wu, J.**, Mukhopadhyay S., Pérez-López, E\*. Refinement of the *Brassica napus* NLRome using RenSeq. *Plant Physiology* (Submitted, under review)
- Mukhopadhyay S., Javed, MA, **Wu, J.**, Pérez-López, E\*. Structure-guided secretome analysis of gall-forming microbes offers insights into effector diversity and evolution. *Nature Communications* (Submitted, under review)

## Posters & Presentations

- **Jiaxu Wu.** Low temperature stress tolerance in silage-corn: role of phosphatidic acid. *Agriculture and Agri-Food (AAFC) - Grenfell Graduate Student Session 2: Plant Growth and Health*, Memorial University of Newfoundland, NL, April 27<sup>th</sup>, 2021.
- **Jiaxu Wu**, Muhammad Nadeem, Dmitry Sveshnikov, Raymond Thomas, Lakshman Galagedara, Mumtaz Cheema. Effects of low temperature stress on physiological and biochemical processes of silage-corn genotypes. *Tri-Society Virtual Conference (CPS, CSA and CSHS)*, July 8<sup>th</sup>, 2021. (**Winner of the 2<sup>nd</sup> position in the poster competition**) <https://doi.org/10.1080/07060661.2021.2009254>
- **Jiaxu Wu.** Understanding the molecular basis of NLR-mediated clubroot resistance in *Brassica napus*. *3MT, Faculty of Agriculture and Food Sciences*, Université Laval, QC, March 15<sup>th</sup>, 2023. (**Winner of the 1<sup>st</sup> position in the presentation competition**)
- **Jiaxu Wu**, Soham Mukhopadhyay, Edel Pérez-López, Unveiling the clubroot-resistant canola (*Brassica napus* L.) NLRome. *2023 CSPB Annual General Meeting*, Quebec City, QC, June 18<sup>th</sup>, 2023.
- **Jiaxu Wu**, Unveiling the clubroot-resistant canola (*Brassica napus* L.) NLRome. *2023 IBIS Student Day*. Université Laval, QC, August 25<sup>th</sup>, 2023.
- **Jiaxu Wu.** Resistance gene enrichment sequencing (RenSeq) – based refinement of *Brassica napus* NLRome. *Plant Canada*, Winnipeg, MB, July 10<sup>th</sup>, 2024 (**Honorable mention in the poster competition**)
- **Jiaxu Wu.** Resistance gene enrichment sequencing (RenSeq) – based refinement of *Brassica napus* NLRome. *Annual CRIV Symposium*, Université Laval, QC, August 28<sup>th</sup>, 2024 (**Winner of the 1<sup>st</sup> position in the poster competition**)

## Research Experiences & Training

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- **Biological Characterization and Toxicity Assay of *Fusarium Oxysporum* of *Albizia julibrissin***

04/2016-05/2017 | Volunteer

This is a Student Research Training Program (SRTP). The objective of this project is to biologically characterize the *Fusarium Oxysporum* of *Albizia julibrissin* in Luoyang City. **I led 2 undergraduate students in this project.** We surveyed and collected related plant materials and extracted wilt samples in Luoyang, China. Then, I isolated and purified pathogenic fungus in media and conducted morphological and molecular identification to verify *Fusarium Oxysporum*. Besides, I was also involved in writing funding application. This work was supervised by Prof. Jun Hou at Henan University of Science and Technology.

- **Bachelor Graduation Thesis**

01/2018-07/2018 | Project leader

The title of my bachelor's thesis is “**Effects of Interaction between Arbuscular Mycorrhizal and Phoxim on Growth of Chinese Chive (*Allium tuberosum*)**”. The results indicate that the application of phoxim has a certain stress and the peroxide content in the plant has increased on the Chinese chive. Inoculation with AMF effectively enhances the nutrient accumulation and stress resistance of Chinese chive. This work was supervised by Prof. Shuangchen Chen at Henan University of Science and Technology.

- **miRNA Analysis Related to the Resistance against *Fusarium oxysporum* Induced by *Trichoderma* in Cucumber**

12/2015-08/2016 | Volunteer

In order to find MicroRNA (miRNA) related to the resistance against *Fusarium oxysporum* Induced by *Trichoderma* in cucumber plants. We constructed the small RNA library of cucumber root and used Illumina sequencing to analyze the small RNA library. A total of 92 known miRNAs were screened and 63 new miRNAs were predicted. In this project, my contribution was extracting high-quality total RNA samples which collected from cucumber roots. This work was supervised by Prof. Shuangchen Chen at Henan University of Science and Technology.

- **Analysis on the Effect of *Trichoderma* Against *Fusarium* Wilt in Cucumber**

12/2017-06/2018 | Volunteer

In order to analysis the effects of *Trichoderma* fungi on cucumber fusarium wilt resistance. We found that *Trichoderma* plays an important role in *Fusarium oxysporum* defense response by regulating redox homeostasis in the cucumber roots. In this study, I measured the oxidative stress-related contents ( $H_2O_2$ ,  $O_2^-$ , MDA, AsA and GSH) and enzymes activities (SOD, CAT, MDHAR and GR). This work was supervised by Prof. Shuangchen Chen and the master candidate Ms. Hongjiao Zhao at Henan University of Science and Technology.

- **Construction of Recombinant Gene Viral Vector pTRV2-*Fom-2***

07/2018-10/2018 | Research Assistant

In this study, specific primers were designed based on the published *Fom-2* gene in cucumber (GenBank accession number: AY619647.1) and the amplified fragment was 245 bp in length. VIGS technology was applied in this experiment. pMD18-T was used as the vector to construct the recombinant gene viral vector pTRV2-*Fom-2* to quickly identify the function of *Fom-2* gene in cucumber. This work was supervised by Prof. Shuangchen Chen and the master candidate Ms. Hongjiao Zhao at Henan University of Science and Technology.

- **Root membrane lipids as potential biomarkers to discriminate silage-corn genotypes**

02/2019-05/2019 | Research Assistant

In this project, we found that root membrane lipids would act as a proxy or biosignature to discriminate silage

corn genotypes based on their genetic traits for cultivation on podzolic soils in boreal climate. I received training in plant lipid extraction and high-performance liquid chromatography (HPLC) analysis. This work was supervised by Prof. Mumtaz Cheema and Dr. Muhammad Nadeem at Memorial University of Newfoundland.

- **Role of AtGAD1 under phosphorus deprivation**

09/2021-12/2021 | Research Intern

The objective of this project was to find the role of  $\text{Ca}^{2+}$ - dependent glutamate decarboxylase-1 (AtGAD1) phosphorylation under phosphorus resupplied *Arabidopsis thaliana* under phosphorus deprivation. In this project, I received training in the western blotting method. This work was supervised by Prof. William Plaxton at Queen's University, Kingston.

- **Master Research Thesis**

01/2019-04/2022 | Project leader

The title of my master's thesis is "Evaluating Role of Phosphatidic Acid in Cold Stress Tolerance in Silage Corn". The objectives of this research project are: i) to determine the effects of cold and non-cold stress on seedling growth, morphological, physiological, and biochemical attributes of silage corn at early growth stage; ii) to investigate the role of phospholipidome mediation in cold stress tolerance in silage corn at the early growing stage. I designed the experiment and finished most experiment. Moreover, **I led 5 students to conduct plant morphology analysis.** The outcome led to two peer-reviewed publications in Plants and Environmental and Experimental Botany, respectively. The third publication is in preparation. This work was supervised by Prof. Mumtaz Cheema and Prof. Raymond Thomas at Memorial University of Newfoundland.

Link: <https://doi.org/10.48336/QDVD-ZE22>

## Skills

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- **Computational skills**

Microsoft Office

Linux

Python

Data Analysis Software: "R", GraphPad-Prism, SPSS, Minitab, Sigma Plot.

- **Bioinformatic skills**

Genome sequencing analysis: Sanger, Illumina and Oxford Nanopore

Transcriptome analysis

Gene family identification and alignment

Genome assembly

- **Gathered experience in plant genetics, including molecular cloning, plant transformation for RNAi and overexpression, chemical analysis (HPLC), tissue culture, qRT-PCR, western blot etc.**

## Awards

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**August 2024**

First Prize of Poster Award, *Annual CRIV Symposium* (\$ 300)

**July 2024**

Honorable Mention of Poster Award, *Plant Canada 2024*

**April 2024**

Doctoral Scholarship, Fonds de recherche du Québec (\$ 7,5000)

**March 2023**

First Prize of English Section, *Three-minute Thesis (3MT)*, Faculty of Agriculture and Food Sciences, Université Laval (\$ 250)

**October 2022**

Fellow of the School of Graduate Studies 2022-2023, Memorial University of Newfoundland

- July 2021**                      Second Prize of Poster Award, *2021 Tri-Society Virtual Conference* (\$ 100)
- November 2014**              First Prize, *College Student English Speaking Contest*, Henan University of Science and Technology (\$ 150)
- October 2014**                *University Freshman Scholarships*, Henan University of Science and Technology (\$ 1,000)

## Other Information

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- **Extracurricular Activities**

**1 Tax clinic volunteer (March 2019 – May 2019):** I participated in the “Community volunteer income tax program” at Memorial University of Newfoundland. This program is led by Prof. Lynn Kendall. In this program, I got training on how to complete income tax returns and then returns for university students and the people of the local community (especially senior people and modest income earners).

**2. Library volunteer (May 2017 – November 2017):** I worked as a volunteer in the library of Henan University of Science and Technology during weekends. My duty is to clean returned books and place them in the correct location by the alphabet order.

**3. Botanical Garden volunteer (April 2015 - June 2016):** Every Spring season, Luoyang City attracts lots of tourists because of the Peony Culture Festival of Luoyang. I joined the Wangcheng Park’s volunteer team in 2015 Spring. My job was recording the growth of the peony flowers and introducing the basic knowledge of peony (growth habits, varieties and flower types) to the tourists.

**4. Vice-chair of recreation department, Student Union (October 2014 – October 2016):** I joined as a member of the student union’s recreation department at Henan University of Science and Technology and became the vice-chair in March 2015. During that time, **I was the leader and organized some events including graduation gala and talent show contest.**

- **Internship and Work Experiences**

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|------------------------------|---|
| March 2017-July 2017         | Intern, Floriculture, Sui Tang City Botanical Garden, China   |
| September 2017-December 2017 | Intern, Luoyang Sixin Vegetable Cultivation, China  |
| July 2018-November 2018      | Research Assistant, the Laboratory of Vegetable Stress Tolerance, Henan University of Science and Technology, China |
| January 2019-January 2021    | Research Assistant, Boreal Ecosystem Research Initiative Lab (BERI), Memorial University of Newfoundland, Canada    |

- **Memberships**

- 1. Member (May 2023 – present),** Canadian Society of Plant Biologists
- 2. Member (October 2023 – present),** American Phytopathological Society
- 3. Member (January 2023 – January 2024),** Canadian Phytopathological Society
- 4. Member (May 2019 – May 2022),** Canadian Society of Agronomy

**Declaration,** the above information is given from best of my knowledge and all are correct.