MSCA COFUND Doctoral Fellowships “Molecular Regulation of Plant Abiotic and Biotic Stress Tolerance in Protein Crop Faba Bean”

Summary

This PhD topic is part of the INNOCHEMBIO Doctoral Programme, which is funded through the Marie Skłodowska-Curie Actions (MSCA) COFUND action. The main objective of INNOCHEMBIO is to train future experts of sustainable chemistry and biotechnology, helping Europe to take the next steps in the green transition. This project aims to unravel novel mechanisms in plant stress signalling and translate this knowledge into crop improvement, specifically to develop new strategies for precision breeding of faba bean. This PhD position will be hosted at TalTech with main supervisor Dr. Triin Vahisalu and will contain a secondment to co-supervisor Prof. Alan Schulman at University of Helsinki (FI).

Research field:	Chemistry and biotechnology
Supervisor:	Triin Vahisalu
Availability:	This position is available.
Offered by:	School of Science Department of Chemistry and Biotechnology
Application deadline:	Applications are accepted between July 01, 2025 00:00 and August 31, 2025 23:59 (Europe/Zurich)

Description

1. General description of programme and host

The PhD fellowship is part of the Marie Skłodowska-Curie Actions (MSCA) COFUND doctoral programme INNOCHEMBIO (https://taltech.ee/en/innochembio), which is co-funded by the European Union (Grant agreement 101217295). The main objective of INNOCHEMBIO is to train future experts to help Europe take the next steps in the green transition. The solutions and trained experts can reduce the environmental impact of the chemical and agricultural industries, offer eco-friendly analytical techniques, and assess the safety of new materials. INNOCHEMBIO funding will co-finance **15 PhD positions**, for which the application process in the first call will start on the **1st of July in 2025**.

For 12 PhD positions the hosting institution will be Department of Chemistry and Biotechnology (DCB) at Tallinn University of Technology (TalTech) which combines three divisions – Chemistry, Gene Technology and Biomedicine, and Food and Biotechnology. DCB is developing solutions to the great challenges of the 21st century – climate change, environmental protection, carbon neutrality, renewable energy, and biodiversity conservation. DCB hosts the second biggest PhD programme in TalTech with nearly a hundred enrolled students.

For 3 PhD positions the hosting institution will be the implementing partner – National Institute of Chemical Physics and Biophysics (NICPB). NICPB is a public research institution that conducts both fundamental and applied research, developing novel directions in fields ranging from material sciences to informatics. NICPB houses the Laboratory of Environmental Toxicology and several laboratories focused on fundamental research in NMR technologies with expertise dating back decades. The PhD training activities conducted by NICPB are funded through TalTech.

Importantly, each PhD project has one co-supervisor from another European country, which is detailed under the specific offer (see under supervisors' section). In total, INNOCHEMBIO has **19 associate partners from 11 European countries**.

2. Description of specific PhD project

Introduction

In the face of climate change, agricultural productivity and food security are critical global challenges exacerbated by population growth and geopolitical instability. To address these issues, understanding plant response mechanisms to

various stresses at the molecular level is crucial for developing robust cultivars that can thrive in a changing climate. Persistent crop losses due to plant diseases and sub-optimal growth conditions are significant barriers to global food sufficiency, and climate change further heightens plant vulnerability. Therefore, designing the next generation of crop plants capable of withstanding harsh climate conditions while resisting pathogen attacks is imperative.

Research Context and Objectives

Our research project aims to unravel novel mechanisms in plant stress signaling and translate this knowledge into crop improvement. Although molecular mechanisms in stress signaling have been extensively studied, many signaling pathways remain incomplete, necessitating further exploration. Our team has identified uncharacterized regulators essential for activating plant defense reactions through a mutant screen in Arabidopsis. These gene identities have been confirmed via whole-genome sequencing, setting the stage for groundbreaking discoveries.

The project leverages translational biology to apply molecular breeding techniques to develop climate-resilient crops. We focus on Vicia faba (faba bean), an ancient crop with high protein yield potential, suitable for Nordic climates, yet vulnerable to various stresses. Additionally, we study barley, a globally significant grain, serving as a model for genomic and molecular studies. We address the physiological and molecular function of the newly identified (highly conserved) regulators from Arabidopsis also in crops by exploiting gene editing through CRISPR/Cas9 technology.

Research Opportunities for the PhD Candidate

As a PhD candidate, you will have the opportunity to work with cutting-edge methods in plant biology, including phenomics, gene editing, molecular interaction studies, microscopy, and transcriptomics. By implementing a multidisciplinary approach, you will address the molecular and physiological regulation of novel proteins to enhance plant fitness, targeting regulatory amino acids or interaction partners. You will contribute to targeting stress resistance pathways in faba bean and/or barley, providing strategies for future crop improvement. This translational biology approach offers potential targets for genetic manipulation, leading to agronomic benefits.

Why Join Us?

The project is built on solid pre-existing data, with novel regulators already identified and gene identities confirmed, providing a head-start for your research. You will be integrated into ongoing consortia, including FabaNova (international) and MARTA (national) for faba bean research, and RecoBar (international) for barley research.

By advancing plant stress tolerance research, this project aims to contribute to overcoming current limitations in understanding molecular regulatory networks necessary for activating plant defense reactions. Your work will contribute to enhancing sustainable and self-sufficient food production in Estonia and globally, aligning with the 2030 Agenda for Sustainable Development Goals, including “Zero Hunger” and “Responsible Consumption and Production.” Join us in this highly novel and impactful project, where your research will have the potential to shape the future of crop breeding and sustainability.

Link to the project: https://taltech.ee/en/innochembio/vahisalu

3. Supervisory team

- Tallinn University of Technology (main supervisor): Dr. Triin Vahisalu
- University of Helsinki (Finland): Prof. Alan Schulman (The PhD student will stay 6-16 months at the co-supervisor's lab as mutually agreed upon).
- Tallinn University of Technology: Dr. Cecilia Sarmiento

4. Requirements

- Excellent command of written and spoken English.
- MSc degree or equivalent in molecular biology, chemistry, biotechnology or equivalent.
- Compliance with the rules of INNOCHEMBIO (e.g. eligibility, adhering to MSCA mobility rules, etc.).
- The primary workplace will be in Estonia. Therefore, candidates from outside the EU must be eligible to obtain a visa. The position is expected to start in the first half of 2026.
- We seek a highly motivated PhD candidate with a passion for plant molecular biology.
- The ideal candidate should have a solid background in molecular biology, including proficiency in cloning, DNA/RNA isolation, and PCR techniques, along with hands-on lab experience.
- While experience with plants is beneficial, it is not required.
- Candidates should have a keen interest in plant stress tolerance,translational biology, and precision breeding, and be ready to learn new techniques.

- Independent thinking, strong analytical, problem-solving, and communication skills are essential for success in our collaborative research environment.

5. Duties and Responsibilities

- Undertake postgraduate research for specific doctoral research project at TalTech or NICPB, respectively.
- Present and publish research in both academic and non-academic audiences. Attend and participate in academic and non-academic conferences, events and seminars.
- Attend and participate in all training events and supervisory meetings.
- Be seconded to the associated partner as necessary to fulfil the grant obligations.
- Prepare progress reports and similar documents on research for funding bodies, as required.
- Actively contribute to the public engagement and outreach activities of the project.
- The above job descriptions are not exhaustive, the PhD candidate may be required to undertake other tasks, which are broadly in line with the above duties and responsibilities.
- Full-time employment (40 hours per week), temporary contract for 4 years.

6. Eligibility requirements

- The applicant must be a doctoral candidate (i.e. not already in possession of a doctoral degree at the date of the recruitment).
- At the time of recruitment, the researcher must not have resided or carried out their main activity (work, studies, etc.) in Estonia for more than 12 months in the three years immediately prior to the recruitment date. Compulsory national service and/or short stays such as holidays are not taken into account.

7. Benefits

- Competitive funding scheme, with a minimum gross monthly salary of EUR 2500. Topped by additional mobility allowances as well as optional family allowances (if applicable).
- Covered tuition costs, research costs and funding for short term mobility (i.e. conference attendance).
- Interdisciplinary and international research projects.
- Early-stage researcher position, with corresponding social and medical benefits in Estonia.
- Becoming a Marie Skłodowska-Curie PhD fellow.

8. How to Apply

All applications must be sent through TalTech's official application platform Glowbase and only applications submitted here will be considered for the programme. We ask the candidates not to contact the supervisors directly, in case of questions please write at innochembio@taltech.ee. Each application must include the following material: CV, 1-page motivation letter, copies of BSc and MSc study records and diplomas, scanned copy of valid photo ID, 2 reference letters, eligibility statement.

NB! The INNOCHEMBIO programme has additional requirements compared to the standard TalTech application process. Details on the exact nature of these documents and how to insert them in Glowbase can be found at our official INNOCHEMBIO website: https://taltech.ee/en/innochembio/application-process. **If any of the required documents are missing, the candidate will not be eligible to proceed to the selection stage.**

9. Selection Process

The selection and recruitment process will be in accordance with the European Charter and Code of Conduct for the Recruitment of Researchers. The recruitment process will be open, transparent, impartial, equitable, and merit-based. There will be no overt/covert discrimination based on race, gender, sexual orientation, religion or belief, disability or age. To this end, the following selection criteria will be considered.

The application deadline is 31 August 2025. The application process will be carried out in 3 steps. In short, first an eligibility check is performed. All eligible candidates will proceed to stage 1, where they will be evaluated by independent evaluators based on the application documents. Lastly, shortlisted candidates from stage 1 will proceed to stage 2, where they will be interviewed via teleconference, which will be used to determine a candidate to whom an offer will be made. All candidates will be informed about the progress in due course after each step of the process. The selection process is described on the guide for applicants available here: https://taltech.ee/en/innochembio/application-process.

10. Disclaimer

By applying for this position, the applicants

1. give their consent to circulate their application and personal data within the INNOCHEMBIO consortium and with the evaluators;
2. confirm that the data provided is valid and accurate;
3. confirm compliance with the eligibility requirements;
4. commit to undertaking the planned secondment at the co-supervisor’s institution.

To get more information or to apply online, visit https://taltech.glowbase.com/positions/1030 or scan the the code on the left with your smartphone.