

Faculty of Agricultural, Environmental and Food Sciences

PhD programme in FOOD ENGINEERING AND BIOTECHNOLOGY

Website: <https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/phd-in-food-engineering-and-biotechnology/>

Duration: 3 years

Academic year: 2024/2025

Start date: 01/11/2024

Official language: English

1 position financed by European Social Fund Plus

Programme contents

The Ph.D. in *Food Engineering and Biotechnology* is a full-time programme held in English. Ph.D. students should benefit from the special multilingual opportunities offered by the University, which include activities/events in Italian, German or other languages (e.g., seminars, optional courses, social events). The Ph.D. programme comprises lectures and research activities that can be completed both at the Free University of Bozen/Bolzano and at universities abroad. The time spent abroad can be at one of the foreign universities where foreign members of the Ph.D. Course Committee are coming from or at other universities or research centres, including prestigious Italian institutions.

The Ph.D. programme is based on the following milestones:

- students develop and organize their research plan, including the state-of-the-art of their research topic, in the first 6 months of the course together with their supervisor or co-supervisors. At the latest after six months, students must defend their research plan in front of the Ph.D. Course Committee;
- students have to take part in at least one international conference where they are expected to present a paper or a poster;
- students must spend at least 3 months abroad or at prestigious Italian institutions conducting research;
- students must attend specific compulsory courses, focused on the analysis of literature and writing scientific articles and on advanced statistics as well as other courses or summer schools courses approved by the PhD Course Committee, and pass the relevant exam. The minimum requirement for the admission to the PhD programme with regard to English language proficiency is level B2; students must submit a language certificate and the English knowledge will also be tested during the oral exam; at the end of the three-year programme each PhD student must have achieved the C1 level. Therefore students should attend English courses offered by the Language Center of unibz focused on the preparation and achievement of this final level of English language.
- In order to be admitted to the final exam, students must have published or submitted for publication in international peer-reviewed journal at least three articles where they figure as first, second or last author. Exceptions to this rule, if adequately motivated, will be evaluated and eventually approved by the Scientific Committee.

Stages of the PhD

The research activities are spread over five stages, respectively, after 2, 6, 12, 24 and 36 months. At the end of each stage, students have to meet the Ph.D. Course Committee to present their project and/or results. The Ph.D. Course Committee assesses students' work and provides suggestions if needed.

First stage (first 2 months): the Ph.D. Committee meets the students, appointing the supervisor. Students and their supervisors decide on their research topic within the areas listed in the call for applications. Students also work on a study plan that has to be approved by the Ph.D. Committee.

Second stage (2nd - 6th month): students, after an exhaustive review of the literature concerning their subject area, have to prepare their research programme that has to be approved by the Ph.D. Course Committee. Students will follow courses that are relevant to their individual study plan. Students prepare their public seminar that will take place at the Free University of Bozen/Bolzano, where they discuss the state-of-the-art of their research topic.

Third stage (6th - 12th month): students begin their research in the lab and/or field, and can also attend courses and summer schools. During this stage they will also present to the Ph.D. Committee their research programme that they want to conduct abroad or at prestigious Italian institutions in the following years. In addition, they propose a co-supervisor at the university or research centre for approval and prepare a report about the first-year activities.

Fourth stage (12th - 24th month): students continue their research and finish any courses that they have been following. At this stage, it is likely that some of this time will be spent abroad or at prestigious Italian institutions. At this stage or in the next one, students are also expected to attend international conferences to present their results, also starting the preparation of the manuscript(s) for publication in peer-reviewed journals. The student presents to the Ph.D. Course Committee a report about the second-year activities.

Fifth stage (24th - 36th month): students finish their research and any experiences abroad or at prestigious Italian institutions; they finish writing the manuscript(s) that are to be published and finish their thesis. To be admitted to the final exam the student has to present to the Ph.D. Course Committee a report about the third-year activities and about his final thesis.

Research areas:

The following research areas, including sub-headings, are considered in the Ph.D. on Food Engineering and Biotechnology.

Primary food production

This issue mainly concerns those foods that are not subjected to technology processing, and their relationships with the agriculture and environmental features. The main goal is to focus on natural, sustainable and high performing processes and products. Non-restrictive examples of related research areas are as follows: renewable technologies and sensors in agriculture engineering; sensors and predictive tools for application in agricultural industries; precision agriculture; identification of microbial and plant metabolic markers in response environmental stresses and nutritional supply; thermo-conversion of agriculture and food by-products for the production of chemical compounds; development and evaluation of processes in the company for the preservation of plant products.

Set-up, management and validation of food processes

This issue mainly concerns food processing, with particular emphasis to the set up, and consequent management and validation, of novel processes for the manufacture of products with very high quality sensory, rheology, hygiene and nutritional attributes. Non-restrictive examples of related research areas are as follows: optimization of structure, aroma and hygiene of food and beverages (wine chain); point-of-care diagnostic for food and beverages (wine) traceability, quality assessment and smart packaging; application of non-thermal technologies and rapid methods (e.g., electrochemical biosensors); food microstructure engineering; biotechnology production of natural foods through the gene and enzyme conditioning; conditioning of the chemical changes of food compounds with high nutritional value; study and definition of chemical and sensory markers of authenticity and process for food and beverages (wine) as strategic decision support for food companies and wineries.

Application of the omics techniques

This issue mainly concerns the application of food omics platforms (meta-genomics, proteomics and/or metabolomics) for conditioning and characterizing food processing and products, with particular emphasis towards fermented foods and beverages. Omics platforms will deserve an interest also to characterize the food-human axis, aiming at strengthening the role of the gut microbiome. Non-restrictive examples of related research areas are as follows: functional characterization of foods and related microbiota for the manufacture of fermented foods; set-up of microbial food processes for improving the nutritional and functional attributes; characterization and use of chemical nutrients that affect the response by the human gastrointestinal microbiome; exploitation of the potential of food by-products.

Research project and supervisor	
Title	Supervisor/s
<p>1. Antioxidant reactivity and capacity of food matrices during processing and storage by combining DSC, electrochemical and NMR techniques (cf: Smart Specialisation Strategy Innovazione e Ricerca Alto Adige 2030 - Smart Specialisation Strategy (RIS3) della Provincia Autonoma di Bolzano - Alto Adige – only available in Italian and German)</p> <p>This research project aims to investigate the mechanisms by which antioxidants neutralize free radicals, focusing on the synergism that different antioxidants exert in inhibiting oxidizable food substrates. The study will investigate the stability of antioxidants during food processing and storage and how interactions between antioxidants and nutrients such as fats, proteins and carbohydrates influence antioxidant efficacy. The project is divided into three phases: (1) development of methods to study free radical scavenging mechanisms and synergistic effects using kinetic-based assays (DPPH-kin, ORAC-kin) and HPLC methods coupled with electrochemical detection recently published by the proponent group; (2) evaluation of antioxidant stability during processing and storage using differential scanning calorimetry (DSC) to simulate realistic food processing conditions; and (3) investigation of antioxidant-nutrient interactions using the above techniques together with nuclear magnetic resonance (NMR). This research addresses significant gaps in the literature by combining DSC, electrochemistry, and NMR to provide a comprehensive and integrated analysis of antioxidants. Expected results include improved understanding of antioxidant mechanisms, identification of synergistic combinations, improved stability methods, and insight into nutrient interactions, contributing to the development of functional foods and evidence-based dietary recommendations. The innovative aspect of this research is the study of antioxidants in real food formulations and the simulation</p>	<p>Prof. Matteo Mario Scampicchio</p>

of food processing, which will have a significant impact on the development of functional foods and practical applications in the food industry.	
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Admission requirements – Evaluation criteria for examinations/qualifications

- Degrees from the old Italian system: all
- Master (laurea specialistica/magistrale): all
- Participants must also be under the age of 35 years, to be understood as up to the day before the participant's thirty-fifth birthday. The requirements must be fulfilled at the time of the deadline of the relevant call for applications (11th July 2024).

Foreign degrees

Applicants who got their degrees abroad must have university education of at least five years and hold the prerequisites listed below.

Other

The prerequisites for admission to doctoral programmes are related to having achieved an appropriate educational, and/or cultural background, and/or have worked in the Ph.D. course areas of research. Qualifications in food science, agriculture, biotechnology and food engineering are preferable.

Admission to the programme is based on the assessment of applicants through:

- CV and academic qualifications;
- the cover letter, mainly based on the motivation for applying to this Ph.D. programme;
- English Language certification at level B2 (or higher levels);
- interview.

When submitting their application, applicants must indicate on the portal a maximum of 3 research topics chosen from the list of titles indicated. The choice is not binding.

To apply for the PhD programme, applicants must include the following documents:

- personal statement written in English (max. 1 page).
- Curriculum vitae (CV) (in English and possibly following the EU format that can be downloaded here <https://europass.cedefop.europa.eu/en/documents/curriculum-vitae>).
- Master degree certificate/exam transcript. **For admission, the (exams) average grade of master's degree (or equivalent) must be greater than or equal to 24/30.** For foreign degrees, if the marking system is different, the mark will be transformed. **In case of Italian university titles the certification MUST be substituted by a self-declaration or by the Diploma Supplement.**
- English language certificate at level B2 (or higher levels).

Language skills are demonstrated on the pre-registration portal (in the "upload language certificates") after completing the pre-registration form in the "create/manage applications" section. If the language skills are demonstrated by a high school diploma/diploma or master's degree, the diploma must also be uploaded a second time in the above section.

If the certificates or diplomas were awarded by **Italian** public bodies, the relevant self-certifications must be completed in the portal.

If the certificates or diplomas were awarded by **foreign** bodies, the certificates or diplomas must be uploaded to the portal.

Linguistic competence can be proven by:

- If the **main language of instruction in the final year of the diploma** is English, it counts as C1.
- **A bachelor's or master's degree** in English certifies the C1 level. unibz graduates must upload the language certificates they have obtained or declare that they have passed the language examinations at the unibz Language Centre (B2, B2+ or C1).
- **A recognised language certificate** (see the list of recognised certificates from the Language Centre: <https://www.unibz.it/it/services/language-centre/study-in-three-languages/>). **Please note:** the certificate must not have been obtained more than 5 years before the application for recognition.

Other documents to be included in the application if available:

- reference letters, written in Italian, German or English from a university lecturer or a researcher from a research institute;
- List of publications (published, being published or submitted for publication), with related links, if possible.

Only the applicants with the above mentioned pre-requisite will be taken into account. The Evaluation Committee will first evaluate the CV, the personal statement letter and the applicant's qualifications - including publications (if any) - taking also into account the appropriateness of the candidates' profiles with the PhD programme research areas, and will then draw up a list of applicants admitted to the next stage of the selection process. This will consist of an interview, in which their basic knowledge in one or more research areas of the Ph.D. programme will be assessed. The interview can make use of media such as video-conferencing, telephone and the like. The Committee will select the best applicants on the basis of a comparative assessment.

The following points will be awarded:

- up to 10 points for: the applicant's CV, cover letter and qualifications;
- up to 10 points for the appropriateness of the CV regarding the research areas of interest for the PhD programme;
- up to 20 points for the interview.

The final score is the sum of the previous scores. The maximum score is 40. The lowest score to be admitted to the rank list is 20/40. The final score is used for the ranking of applicants and to establish access to the PhD programme and who will receive grants.

The ranks list will be published on the website of unibz [Ranking lists / Free University of Bozen-Bolzano \(unibz.it\)](#)

Examination dates:

Description	Date	Place
Interview	24 th and 25 th July 2024	Online via MS Teams

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