

Faculty of Science and Technology

PhD programme in FOOD ENGINEERING AND BIOTECHNOLOGY

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

Duration: 3 years

Academic year: 2022/2023

Start date: 01/11/2022

Official language: English

Programme contents

The Ph.D. in *Food Engineering and Biotechnology* is a full-time programme held in English. The Ph.D. thesis has to be written in English and accompanied by German and Italian abstracts. 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 six 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 the updating of the 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 this admission bulletin. 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; 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.

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.

Possible research projects and supervisors (List of available projects, other topics dealing with the activity of the research groups can be matter of study)	
Title	Supervisor
1. Extraction and isolation of natural antioxidants by supercritical fluids and liquid chromatography with enhanced activity to inhibit food oxidations.	Prof. Matteo Scampicchio
2. Study of chemical and sensory markers for precision oenology as component of the Decision Support System for the wineries	Prof. Emanuele Boselli
3. Investigation of the role of microplastics as a vector of microbial genetic resistances into the open environment under the One-Health vision.	Dr. Lorenzo Brusetti
4. Innovative technologies for the formulation of bioactive ingredients from plant-based by-products and development of functional foods.	Prof. Giovanna Ferrentino
5. Population genetic and ecological study of invasive agricultural insect pest species and their impact into the agricultural production and the environment	Prof. Hannes Schuler
6. Application of microbial and protein hydrolysates-based biostimulants in vegetable crops to elucidate their mode of action and to improve plants resistance to multiple abiotic stresses.	Prof. Youry Pii/Prof. Stefano Cesco
7. Valorization of food wastes and food processing residues by means of innovative thermochemical conversion processes in a circular and polygenerative perspective	Dr. Francesco Patuzzi
8. Nutritional aspects of the sourdough fermentation for making baked goods	Prof. Marco Gobbetti
9. Diet, probiotics and prebiotics to improve the composition and functionality of the human gut microbiome: invitro and in vivo challenges	Prof. Raffaella Di Cagno/Prof. Marco Gobbetti
10. Cheese fermentation to improve the sensory and nutritional attributes and to decrease the time of ripening	Prof. Raffaella Di Cagno/Prof. Marco Gobbetti

11. Metabolism of phenolic compounds and fatty acids during plant based food fermentation	Prof. Raffaella Di Cagno
12. Environmental sustainability and food safety in fruit	Prof. Fabrizio Mazzetto
13. Gut-brain probiotic axis	Prof. Marco Gobbetti
14. Low-cost and novel sensors for fruit maturity assessment along the whole quality chain	Prof. Paolo Lugli
15. Integrated metabolomic approaches applied to the authenticity control of organic wines	Prof. Matteo Scampicchio
16. Functional screening of microbial resources for healthy food fermentations through a predictive understanding of genotype-phenotype relationship	Prof. Raffaella Di Cagno/Prof. Marco Gobbetti

Admission requirements - Evaluation criteria for examinations/qualifications

Degrees from the old Italian system: all

Master (laurea specialistica/magistrale): all

Foreign degrees

Applicants who have done 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:

1. If the **main language of instruction in the final year of the diploma** is English, it counts as C1.
2. **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).
3. **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.

A lot will be drawn to decide on the allocation of places. The ranks list will be published on the website of unibz (www.unibz.it/phd).

Examination dates:

Description	Date	Place
Interview	18 - 20 July 2022	At unibz or via MS Teams according to one's

		availability - if not otherwise communicated
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Positions and scholarships

Total positions:	13
Positions with scholarships from the University:	7
Positions with external co-funding:	5
Positions without scholarship:	1

PhD scholarships bound to specific research topics/areas:

1 scholarship with bound research topic and minimum 6-month study period abroad requirement pursuant to MD 351/2021 funded by PNRR:

Research topic:

1. Environmental sustainability and food safety in fruit

2 scholarships with bound research topic and minimum 6-month study period abroad and minimum 6-month in-company internship pursuant to MD 352/2021 funded by PNRR:

Research topics:

1. Gut-brain probiotic axis (in collaboration with Giuliani SpA)
2. Low-cost and novel sensors for fruit maturity assessment along the whole quality chain (in collaboration with Laimburg Research Centre)

1 scholarship with bound research topic in collaboration with Université Franco-Italienne UFI, if financed.

Research topic:

1. Integrated metabolomic approaches applied to the authenticity control of organic wines

1 scholarship with bound research topic and linked to European funds of the HORIZON-CL6-2021-FARM2FORK-01 project:

Research topic:

1. Functional screening of microbial resources for healthy food fermentations through a predictive understanding of genotype-phenotype relationship