



# MASTER Biology Agrosciences (B2AS)

## Program factsheet

### ACADEMIC COOPERATION

#### Collaboration with:

- › Ecole Nationale Supérieure des Sciences Agronomiques de Bordeaux (France)
- › University of Tsukuba (Japan)
- › National Taiwan University (Taiwan)
- › Pontifical Catholic University of Chile (Chile)

### LEVEL

Master degree (Year 2).

### ADMISSION REQUIREMENTS

#### Candidates must fulfill the following requirements:

- › Hold a Master (Year 1) degree (60 ECTS) in any field related to biology with majors in molecular biology, biochemistry and/or genetics.

### LANGUAGE REQUIREMENTS

English: certifiable equivalent of TOEFL score of 550/213/79-80 or IELTS score of 6.0.

### PROGRAM DURATION

1 year (60 ECTS).

### TUITION FEES

Master tuition fees applicable for the University of Bordeaux.

## Program outline

The Bordeaux Biology AgroSciences Master (B2AS) is part of the University of Bordeaux Master program and is developed with the support of the French National Institute of Agricultural, Food and Environmental Research (INRAE) and the Bordeaux AgroScience Engineer School.

The B2AS program offers an integrated multidisciplinary approach that is adapted to the realities of research (background research) as well as to the socio-economic sector (professional courses).

The program objectives are to train and equip researchers and professionals to face the issues posed by agriculture in the 21st century. This is achieved by integrating plant biotechnology and agrofood technology within course content in order to deal with the challenges of innovation in agriculture.

With such an integrated approach, the Master B2AS represents a meeting point between academia and professionals. During the program, students may specialize either in the field of plant biology, plant health, biotechnology, plant breeding, genetics, plant and human health benefits, food production and innovation.

The wide partner network provides students with a range of complementary expertise. This means that specific competencies are developed for agriculture improvements.

## Strengths

#### During their studies, students will:

- › Acquire scientific knowledge in various fields of plant biology, plant health, plant breeding, green biotechnology, food supplements, food production, etc.
- › Receive a modern research-based training.
- › Develop an understanding of the challenges of modern agricultural practices in a context of environmental constraints and increasing demand.
- › Develop an understanding of the benefits and limits of modern biotechnology.
- › Acquire the skills to develop action planning processes for bioscience.
- › Acquire skills and practice within an English-speaking environment as well as other languages practised within the consortium.
- › Develop the necessary skills to collaborate with international teams and networks.
- › Acquire competencies for knowledge transfer to students and collaborators.
- › Develop competencies to create, finance and manage a new start-up.
- › Acquire an understanding of today's industrial and economic environment within the Biotech sector.

# Program structure

## Semester 1

### Scientific English (3 ECTS)

- › Students will reinforce and develop the reading, writing, listening and speaking skills relevant to a biological science research context.
- › Students will acquire knowledge of the linguistic and discursive features of both written and spoken scientific English.
- › Structure and rhetoric of the research article, writing up an abstract. Oral scientific presentation – students prepare a mini-symposium on the topic related to their future work placement (and thus complete relevant bibliographical and reading research in preparation).
- › Students are evaluated on their communication skills in English and also on their ability to manage complex scientific concepts in English.

### Research and development project design (9 ECTS)

- › Students will learn how to carry out bibliographical research or a technological watch, in order to develop scientific or technological projects within the framework of fundamental or applied research.
- › Students will also have the opportunity to meet professional players by attending seminars and/or company visits.

### Elective courses

3 mandatory courses out of 7 (18 ECTS)

### Plant development and reproduction (6 ECTS)

- › Genetic regulation of root and stem apical meristem functioning, epigenetic regulations of plant development and reproduction, parental imprinting, plant hormones, fruit and seed development, sex determination in plants, cellular mechanisms involved in plant organ growth and development.

### Metabolism and cellular compartmentation (6 ECTS)

- › Metabolism and cell compartmentation: morphodynamic organization of the plant secretory pathway, lipid and protein machineries; membrane transporters in plants and the related methods of study; lipid signaling in plant cells; formation and dynamics of membrane domains; regulation of metabolism and gene expression by sugars in plants. Nature and importance of futile cycles in plants.

### Biotechnology (6 ECTS)

- › In vitro culture and applications, plant transformation and applications to crop plants, GMO legislation and traceability, metabolic engineering, GMO and production of antibodies and of molecules of high health value, GMO in the food industry, fungi biotechnology.

### Plant pathogen interactions (6 ECTS)

- › Plant-Mollicutes interactions, plant-virus interactions: analysis of plant and virus factors necessary for virus cycle, viroids; RNA interference, plant defence mechanisms against pathogens (fungi, bacteria and virus), breeding of plants resistant to pathogens, biodiversity of plant pathogens, epidemiology of plant pathogen interactions and impact on crop production.

### Plant breeding (6 ECTS)

- › Principles of selection and genetic gain, response to selection, germplasm resources, collecting, analysing, classifying, international rules on germplasm resources. Population improvement and cultivar development (breeding for lines, hybrids clones, populations) high throughput phenotyping, breeding strategies and methods including molecular breeding (MAS, genomic selection) and biotechnologies, multiple traits selection,

genotype by environment interaction, protecting varieties and intellectual property, plant breeding international network and organization, advanced statistics.

### Quantitative and population genetics and evolution (6 ECTS)

- › Population genetics and genetic diversity, haplotype structure, domestication and genetic consequences, linkage disequilibrium, genetic variance, estimating variance components, heritability, genetic correlations, association genetics, genomic selection, induced diversity TILLING, natural diversity ecoTILLING, linking genetics, genomics and bioinformatics : from fine-mapping to gene cloning; genotyping by sequencing.

### Omics and bioinformatics (6 ECTS)

- › Data mining using molecular biology databases, bioanalysis design based on alignment sequences or phylogenetic methods.
- › Introduction to Big Data and the production of omics data, algorithmic approaches dedicated to exploiting biological data.
- › Introduction to the various algorithm families used in bioinformatics, bioinformatics programming using Python.
- › Phylogenetic project pipelines.

## Semester 2

### Laboratory practice (6 months / 30 ECTS)

- › In a public laboratory and/or a private company laboratory.

## How to apply?

### Exchange students:

Please refer to the following link: <http://www.u-bordeaux.com/Studying/Applying-Registering/Within-an-Exchange-Program>

### Other students:

Please send the following documents: CV, cover letter, description of the Master (Year 1) major and minors (or equivalent), English level certificate (TOEFL or IELTS) and two reference letters to Pr. V. Schurdi-Levraud.

## Contact

PROGRAM COORDINATOR:

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PATHWAY PROGRAM COORDINATORS:

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[www.master-bio-agro-bordeaux.com](http://www.master-bio-agro-bordeaux.com)

## → And after?

The objectives of the B2AS program are to prepare students for further study via PhD programs and/or careers in agronomy and the food industry throughout the world. This is achieved by providing high-level training in plant sciences but also by preparing students with relevant knowledge and skills in management and business.

Graduates may apply for positions in the following industrial sectors in a R&D laboratory as well as in production activities:

- › Plant research laboratories
- › Plant breeding companies
- › Health plant companies
- › Green and white biotechnology companies
- › Food, diet and nutrition companies
- › Plant medicinal production companies
- › Food supplement or nutraceutical companies
- › Business trade companies

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