

Agricultural Biotechnology

Code: 43866
ECTS Credits: 6

Degree	Type	Year	Semester
4316231 Plant Biology, Genomics and Biotechnology	OB	0	1

Contact

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Use of languages

Principal working language: english (eng)

Teachers

Maria Jose Aranzana Civit
Marc Valls
Núria Sánchez Coll

External teachers

Albert Boronat
Marta Pujol

Prerequisites

Basic Knowledge in molecular biology and plant genomics is required.

Objectives and Contextualisation

The aim of this module is to introduce to the students the fundamentals of Agricultural Biotechnology, with a special emphasis on molecular breeding and modern molecular biology approaches, including transgenesis.

Skills

- Analyze research results to obtain new products or processes, evaluating their industrial and commercial viability for transfer to society.
- Apply biotechnological cell factory methods to plants and fungi to obtain new products.
- Apply knowledge of plant molecular genetics in different scientific and industrial areas.
- Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
- Conceive, design, manage and develop a scientific, technical or industrial project in Biology and Biotechnology of plants and fungi, and be able to interpret and extract knowledge of the same.
- Continue the learning process, to a large extent autonomously.
- Develop critical reasoning in the area of study and in relation to the scientific and business environment.

- Identify and explain social and ethical responsibility in the obtainment and use of genetically-modified plants and recognise the relevant legal aspects of this.
- Identify and use Bio-Computer Science tools to be applied to the genetic, evolutionary and functional study of plants.
- Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
- Synthesize, and analyze alternatives and debate critically.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
- Use and manage bibliographical information and computer resources in the area of study.
- Use scientific terminology to argue the results of research and present them in English both orally and in writing in an international environment.
- Work in a multidisciplinary team.

Learning outcomes

1. Analyze research results to obtain new products or processes, evaluating their industrial and commercial viability for transfer to society.
2. Apply ethical and legal considerations and considerations of social responsibility to the use of genetically-modified plants.
3. Apply molecular breeding to the obtainment of new products.
4. Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
5. Continue the learning process, to a large extent autonomously.
6. Design a plant improvement project that involves transgenesis or editing genomes.
7. Design a plant improvement, research or production project that involves in vitro cultures.
8. Design a programme of marker-assisted genetic improvement.
9. Develop critical reasoning in the area of study and in relation to the scientific and business environment.
10. Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
11. Know and apply suitable tools for molecular breeding, identification, genotyping and diagnosis in plants.
12. Know and apply the strategies best suited in each case to obtain or cultivate genetically-modified plants or to evaluate plant germplasm.
13. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
14. Synthesize, and analyze alternatives and debate critically.
15. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
16. Use and manage bibliographical information and computer resources in the area of study.
17. Use scientific terminology to argue the results of research and present them in English both orally and in writing in an international environment.
18. Work in a multidisciplinary team.

Content

Applications of genetically engineered or edited plants in agriculture

Micropropagation and in vitro culture applied to agriculture

Fundamentals of plant breeding

Molecular breeding

Methodology

-Lectures covering the different topics of the program. Powerpoint presentations will be available in advance at the "campus virtual".

-Reading of selected research papers for presentation and discussion in the seminar sessions

-Practical sessions on bioinformatics tools applied to genomic studies

-Visit to IRTA-Lleida facilities.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Lectures	23	0.92	2, 3, 5, 6, 7, 8, 9, 10, 11, 12
Seminars	10	0.4	5, 6, 7, 8, 9, 10, 11, 13, 17
Type: Supervised			
Oral presentations	20	0.8	1, 2, 4, 9, 10, 13, 14, 15, 16, 17, 18
discussion sessions	5	0.2	4, 10, 14, 16, 17
practical lessons	2	0.08	1, 2, 4, 6, 7, 8, 10, 13, 15
Type: Autonomous			
Student work and learning	88	3.52	1, 2, 3, 6, 7, 8, 10, 13, 15, 16, 17

Evaluation

-Written reports (Exam and exercises on bioinformatics)

-Oral presentation and defense of seminar session

-Attendance and participation in the classroom and seminar sessions

-The student will be "not qualificable" when the mark of the different evaluations does not reach a global minimal qualification of 5.0 (out of 10).

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Written reports (Exam and exercises on bioinformatics)	15%	0	0	8, 9, 10, 13
exam	50%	2	0.08	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18
oral presentation and global participation	35%	0	0	1, 4, 16, 17, 18

Bibliography

Specific bibliography (books, book chapters and journal publications) and useful links related with Agricultural Biotechnology will be provided for the different sessions of the program.