VNIVERSITAT DE VALÈNCIA

Course Guide
33194 Plant Biotechnology

COURSE DATA

Data Subject	
Code	33194
Name	Plant Biotechnology
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1102 - Degree in Biotechnology	Faculty of Biological Sciences	4	Second term

Subject-matter

Degree	Subject-matter	Character
1102 - Degree in Biotechnology	104 - Plant biotechnology	Optional

Coordination

Name	Department
BENLLOCH ORTIZ, REYES	25 - Plant Biology

SUMMARY

Plant biotechnology is an optional subject in the Degree of Biotechnology. The theoretical and practical contents, together with activities that are developed during the course are designed considering two main aspects. First, provide the knowledge that students should have about Plant Biotechnology and second, to avoid overlap with other core and optional courses. In this respect, students have previously studied the following two core subjects: Plant Biology and Obtaining Transgenic Organisms. Also they might be attending an optional course on Molecular Biology of Plants, as well as other somewhat less related disciplines.

Both classical plant breeding and breeding by the use of biotechnological processes are necessary and complementary. On this basis, a first section of the lectures is dedicated to the contributions of in vitro culture of plant cells and tissue to plant breeding. This section is supplemented with the contents of the lab classes, as these subjects are taught almost exclusively in Plant Biotechnology.
The second section focuses on the comparative study of the different systems of plant genetic transformation, analyses of gene expression, and the characterization of transgenes. The content for this section, which includes a practical class, have been limited to avoid overlap with similar plant-related sections on the programs of Obtaining Transgenic Organisms and Plant Molecular Biology.

The third program section is devoted to different applications of genetic manipulation of plants, mainly in relation to tolerance to different types of biotic and abiotic stresses, synthesis of both plant products and exogenous products as well as some aspects of plant development including productivity. The program ends with brief comments on the regulation of the use of genetically modified plants and plant This section includes student debates on recent scientific and general articles.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1102 - Degree in Biotechnology

- Diseñar procesos de manipulación y obtención de productos biotecnológicos.
- Analizar a nivel molecular el resultado de la manipulación de un organismo.
- Aplicar soluciones biotecnológicas a problemas medioambientales.
- Diseñar y aplicar aproximaciones biotecnológicas en el campo de la Agroalimentación.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

First, students must learn Plant Biotechnology.

• Increase their ability to acquire information from articles and scientific texts using different sources.

• In relation to the acquired information, they should understand the real meaning of critical analysis and apply it.

• In practical classes, along with the methodology, students should learn to design experiments and analyze the obtained results.

Students are expected to expand some of the following skills:

• Debate with scientific arguments and always correctly.
• Contribute actively within the groups established for the performance of activities.
• Participate constructively in the development of classes.
• Learn to differentiate between having authority and being authoritarian.

DESCRIPTION OF CONTENTS

1. Theoretical contents

Unit 1. Introduction to plant biotechnology
Unit 2. Physiological and molecular bases of growth and development
Unit 3. Theoretical and methodological bases of plant in vitro culture
Unit 4. Plant regeneration from somatic tissues
Unit 5. Plant regeneration from gametic tissues
Unit 6. Genetic resources and germplasm conservation
Unit 7. Obtaining protoplasts and somatic hybridization
Unit 8. Mutagenesis
Unit 9. Plant genetic transformation
Unit 10. Analysis of transgenic plants
Unit 11. Strategies for improving tolerance to pathogens and pests
Unit 12. Strategies for improving tolerance to abiotic stresses
Unit 13. Strategies to improve plant production.
Unit 14. Regulation and acceptance of genetically modified crops. New Breeding Technologies and legislation

2. Practical contents

1. Preparation and sterilization of media for different in vitro cultures. Disinfection and cultivation systems for plant material
2. Obtaining plants by direct morphogenesis (foliar). Cell dedifferentiation and indirect morphogenesis.
3. Propagation by axillary buds and acclimatization of plants obtained by in vitro culture
4. Virus-induced gene silencing
5. Obtaining transgenic plants (selection with antibiotics and herbicides), study of the heritability of transgenes and analysis of gene expression

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	38,00	100
Laboratory practices	20,00	100
Tutorials	2,00	100
Study and independent work	65,00	0
Preparation of evaluation activities	10,00	0
Preparation of practical classes and problem	15,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

• Attendance at lectures is not mandatory, but recommended especially when the class includes a students´ activity (see section V, and b). Attending the tutorial sessions is also strongly recommended.
• Attendance at practical classes is compulsory.

EVALUATION

The evaluation shall be carried out using the following elements:

-Theoretical exam (70% of the final grade). The exam may consist of multiple-choice questions, short questions and/or a practical case to be developed.

-Evaluation of practical content. This evaluation may be carried out by means of a practical examination or by the presentation of a report. In any case, the value of this part will not exceed 15% of the final grade.

-Other classroom activities (seminar, debate, dissemination...). These additional activities may count to 15% of the final grade.

In order to add the grade corresponding to the practical content and the classroom activities, students must pass the theoretical and practical exam.

REFERENCES

Basic

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