



Universitat de Lleida

DEGREE CURRICULUM  
**BIOTECHNOLOGICAL  
APPLICATIONS OF IN VITRO  
CULTURE OF CELLS AND  
PLANT TISSUE**

Coordination: PELACHO AJA, ANA MARIA

Academic year 2023-24

**Subject's general information**

<b>Subject name</b>	BIOTECHNOLOGICAL APPLICATIONS OF IN VITRO CULTURE OF CELLS AND PLANT TISSUE			
<b>Code</b>	101642			
<b>Semester</b>	2nd Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	<b>Degree</b>	<b>Course</b>	<b>Character</b>	<b>Modality</b>
	Bachelor's Degree in Biotechnology	4	OPTIONAL	Attendance-based
<b>Course number of credits (ECTS)</b>	6			
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRAULA		TEORIA
	<b>Number of credits</b>	1.5		4.5
	<b>Number of groups</b>	1		1
<b>Coordination</b>	PELACHO AJA, ANA MARIA			
<b>Department</b>	AGRICULTURAL AND FOREST SCIENCES AND ENGINEERING			
<b>Teaching load distribution between lectures and independent student work</b>	60 hours face-to-face on-site/online 90 hours student off-site learning			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	English: 100%			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
PELACHO AJA, ANA MARIA	anamaria.pelacho@udl.cat	7,2	

## Subject's extra information

Biotechnological Applications of Plant Cell and Tissue Culture is an elective subject in the 4th course. Students will take this course after having had a first contact with plant cell and tissue culture in the 2<sup>nd</sup> year Plant Physiology and Cell Culture subject or equivalent. The main focus in the Biotechnological Applications of Plant Cell and Tissue Culture subject are the diversity of biotechnological applications that in vitro culture has, from the simplest micropropagation techniques to plant genetic transformation and regeneration, or the most innovative advances in other fields.

The knowledge acquired in this subject will be of particular interest to those who specialize in the agri-food area or that have taken other subjects on plant biotechnology; due to the application of plants and plant compounds to other fields, this subject is also of interest for biotechnologists interested in specializing in other areas (biomedical, animal, environmental or industrial). There will be an update on the development of the in vitro cultivation of plants, both in terms of types of species and on types of processes, and current limitations and challenges will be presented.

After completing this course, the Biotechnology student will be able to develop biotechnological projects related to the manipulation of plants, their parts or their derivatives, for the different productive aspects. Particularly, students will have acquired a solid training that allows them to manage, organize and work autonomously in a plant cell and tissue culture laboratory.

Requirements: 101615 [Fisiologia i cultius cel·lulars vegetals](#) UdL course or equivalent knowledge in plant physiology

## Learning objectives

- Prepare reports, summaries and presentations.
- Apply the acquired knowledge to solving biotechnological problems related to the in vitro culture of plant cells and tissues.
- Independently consult the appropriate information resources to obtain a synthetic approach of the different processes under study.
- Be qualified to work in private companies and in public institutions dealing with the research, development or production of biotechnological products related to the in vitro culture of plant cells and tissues.
- Have a great capacity to design new biotechnological projects (identification of applications, business ideas, workplans, etc.) and to convince employers of the suitability of a biotechnological innovation related to the topic of the subject.

- Develop biotechnological applications and protocols related to the plant cell and tissue culture to obtain products of human interest.
- Work in biotechnology companies in the research, development or production of bioproducts through the in vitro culture of plant cells and tissues.
- Design innovative biotechnological projects by identifying applications, business ideas, workplans and the implementation of new techniques or equipment for plant cell and tissue culture.
- Know and value the social and economic aspects of biotechnological advances and applications related to the plant cell and tissue culture.
- Establish new challenges and goals to achieve, and propose their attainment through the application of the acquired knowledge and the establishment of own criteria in decision-making.

## Competences

### General skills

- GC1 Being able to selectively search for and use sources of information necessary to achieve the training objectives.
- GC2 Interpret scientific-technical information with a critical sense, and be able to make presentations based on this information.
- GC3 Working in a team, with a multidisciplinary vision and with the ability to make a rational and efficient distribution of tasks among team members.
- GC4 Knowing and adequately using the scientific and technical vocabulary of the different areas of Biotechnology.
- GC5 Working in the laboratory applying criteria of quality and good practice.
- GC6 Knowing and knowing how to use the specific software and databases in the different fields of biotechnology.
- GC7 Using the scientific method to analyze data and design experimental strategies with biotechnological applications.
- GC11 Acquiring criteria for choosing the most appropriate analytical techniques for each specific practical case.

### Specific skills

- CE32 To know the use of animal, plant and microbial cells in biotechnological processes.
- CE34 Be able to design the protocol of a specific biotechnological process with the necessary practical requirements to carry it out and its evaluation parameters.
- CE44 To know the main fields of application of biotechnology and acquire basic training in some of them.

### Transversal skills

- CT1 Being able to produce comprehensible written and oral reports on the work carried out, with a justification based on the theoretical-practical knowledge obtained.
- CT2 To be able to communicate and communicate in the international sphere in their professional development.
- CT3 To use information and communication tools and techniques for data analysis and the preparation of oral and written reports and other training and professional activities.

## Subject contents

**Unit 1. Introduction.** Definitions. General characteristics. Basic tissue culture types. Laboratory equipment for in



<b>Master Active Lessons</b>	Master lessons with student participation	Understanding and learning of main concepts	42	Study: to knowm understand and synthesize knowledge	62	4	108
<b>Problems, case studies</b>	Active classroom	Case and problem solving.	4	Learn to solve problems and cases.	8	-	12
<b>Seminars</b>	Active classroom	Discussions, applied activities.	10	Solving and decision-making, dicuss.	10		20
<b>Others</b>	Other activities	Problem solving, searching information, scientific paper discussions	4		6		10
<b>Totals</b>			<b>60</b>		<b>86</b>	<b>4</b>	<b>150</b>

## Evaluation

Type of activity	Evaluation Activity		Mark percentage
	<b>Procedure</b>	<b>Number</b>	
<b>Master Active Lessons Section I</b>	Written exam - General aspects of Plant tissue culture and of transgenic plants*	1	<b>35</b>
<b>Master Active Lessons Section II</b>	Written exam - Plant tissue culture objectives and technologies*	1	<b>35</b>
<b>Seminars, problems and cases</b>	Writing reports/proofs, documents Writing/oral reports, documents, presentations**	1	<b>15</b>
<b>Other guided activities</b>	Presentation of assigned short tasks**	3	<b>15</b>
<b>Total</b>			<b>100</b>

\* Recoverable activities and assessments. Calls according to the calendar (21st November 2023 and 23rd January 2024).

\*\* Non-recoverable activities and assessments

### Alternative assessment:

75% of the mark will correspond to a written exam of the theoretical aspects of the course, to be taken on the day of the second exam of the subject call. If less than 5.0 marks out of 10 are obtained, it must be recovered through a recovery exam on the date of the call for the recovery exam of the continuous assessment.

The remaining 25% of the mark will correspond to written tasks assigned to the student on practical aspects of the subject. The student will have to deliver them through the virtual campus prior to the date of the written exam. This 25% qualification does not require a minimum mark and it is not recoverable.

To be eligible for the alternative assessment, the requirements established by the current UdL assessment regulations must be met.

## Bibliography

### Bibliography. Essential

- CHOPRA VL, MALIK VS, BHAT SR. (Eds) 1999. Applied Plant Biotechnology. Science Publ.
- RAZDAN M.K. 2003. Plant tissue culture. Science Publishers, Enfield, N.H.
- SERRANO M, PIÑOL MT. 1991. Biotecnología Vegetal. Ed. Síntesis, Madrid.
- TRIGIANO R.N. y GRAY D.J. (Eds.) 2011. Plant tissue culture, development, and biotechnology. CRC Press, Boca Raton, FL.
- VASIL I, THORPE TA. 1994. Plant cell & tissue culture, I. Kluwer.

### Bibliography. Supplementary

- BHOJWANI SS, RAZDAN MK. 1991. Plant Tissue Culture. Applications and Limitations. Elsevier
- BHOJWANI S.S. y RAZDAN M.K. 1996. Plant Tissue Culture: Theory and Practice. Developments in Plant Scie. v. 5. Elsevier, Amsterdam.
- BUCHANAN B.B., GRUISEN W.G. y JONES R.L. 2000. Biochemistry & Molecular Biology of Plants. American Society of Plant Biologists.
- CHRISTOU P., KLEE H. 2004. Handbook of Plant Biotechnology. J Wiley & Sons. Chichester.
- DAVIES P.J. (Ed.) 2004. Plant hormones. Biosynthesis, signal transduction, action!. Kluwer, Dordrecht.
- DEBERGH PC, ZIMMERMAN RH. (Eds.). 1991. Micropropagation. Technology and application. Kluwer.
- GAMBORG OL, PHILLIPS GC. 1995. Plant cell tissue and organ culture. Fundamental methods. Springer Verlag.
- GEORGE EF. Plant propagation by tissue culture. Part 1 (1993): The technology. 574p. Part 2 (1996): In practice. Exegetics Ltd., England.
- GEORGE EF, PUTTOCK DJM, GEORGE HJ. Plant culture media. Vol 1. (1987) Formulations and uses. Vol 2. (1988) Commentary and analysis. Exegetics Ltd., England.
- HAMMOND J y cols. 1999. Plant Biotechnology, new products and applications. Springer.
- LUMSDEN PJ, NICHOLAS JR, DAVIES WJ. 1994. Physiology, growth and development of plants in culture. Kluwer.
- MARSCHNER P. (Ed.). 2011. Mineral nutrition of higher plants. Academic Press, London..
- TRIGIANO RN, GRAY DJ. (Eds). 1996. Plant tissue culture concepts and laboratory exercises- CRC Press.