Teaching guide

IDENTIFICATION DETAILS

Degree:	Biotechnology
Scope	Biology and Genetics
Faculty/School:	Experimental Sciences
Course:	AGROBIOTECHNOLOGY
Type:	Optional
ECTS credits:	3
Year:	4
Code:	2051
Teaching period:	Seventh semester
Subject:	Applied Biotechnology
Module:	Biotechnological Processes and Products
Teaching type:	Classroom-based
Language:	Spanish
Total number of student study hours:	75

SUBJECT DESCRIPTION

Agrobiotechnology studies the application of biotechnology in the field of Agriculture. Plants are a product of basic need in fields such as food, obtaining derived products, pharmacology or nutraceutics. The development of new technologies not only makes it possible to implement improvements in these fields, but also to apply biotechnology to new areas such as phytoremediation and the production of synthetic drugs or biopolymers.
This situation makes the socio-economic and environmental projection of new products derived from Agrobiotechnology more complex.

The application of biotechnology to plants has irreversibly changed the way we understand agriculture. Since human beings settled down and began to cultivate plants, the plant environment surrounding human populations has changed, selecting those species that were most useful or most pleasant. With the introduction of traditional genetic improvement, the forced selection of characters of interest began. But it is with the development of molecular biology techniques that the possibility of selecting, isolating and reintroducing almost any character that is desirable has culminated, allowing us to choose and modify plants as we please and expanding the range of possibilities for using vegetables even in previously unimaginable fields. Agrobiotechnology has made it possible to create plants that resist pests, avoiding the need to treat crops with pesticides, or plants that produce products modified in their appearance, for example seedless, non-allergenic or nutrient-enriched fruits that do not need to be added later, improving characters in a short time the traditional improvement sought since it began to be used. But it has also made it possible to implement a new concept, the cultivation of plants as bioreactors to obtain products that they do not produce naturally, such as antigens or insulin, with the advantage of producing them in a eukaryotic organism, or biodegradable polymers, such as bioplastics. Plant production has a number of advantages, mainly from the point of scaling and cost, since plant cultivation is a process optimized for centuries of work. The current situation of Agrobiotechnology and its products confronts us with an unknown reality, in which new plant varieties with modified characters that are present in the environment are being produced. Does this situation entail risks for the concept of Agriculture/Nature as we know it? Does it pose a risk to human and animal health? Are these risks, if any, acceptable? All these questions have been asked with scientific rigor and the results will be discussed in the course. But there is still a reflection of special importance: what is the social perception in this regard? In the era of information and accessibility to content and opinions, how does the communication facet develop to understand science and its applications.

GOAL

Once students know and understand the procedures that allow the realization, analysis and selection of plant organisms, the objective of this course is to familiarize them with the applications in which this knowledge is currently projected and to keep in mind the possibilities posed by the field of Agrobiotechnology.
In addition, the current situation and the socio-economic and environmental projection of products derived from plant biotechnology will be studied.

PRIOR KNOWLEDGE

It is important that students who access the subject have basic knowledge previously acquired in the subjects of Cell Biology, Animal and Plant Physiology, Molecular Genetics and Recombinant DNA Technology, in order to understand the subject and allow adequate learning development.

COURSE SYLLABUS

Module 1: Essential Foundations for Agrobiotechnology

Introduction.
Plant physiology and basic biotechnological tools for agrobiotechnology.
Foundations of soil science.

Plant-microorganism interactions.

Module 2: From tradition to innovation in agricultural production

Traditional agriculture and crop domestication.
Classic genetic improvement.
Agroecology and sustainable agriculture models.

Module 3: Core Applications of Agrobiotechnology

Biotechnology for improving crop productivity and quality.
Plants as biofactories.
Agrobiotechnology for environmental sustainability.

Module 4: Implications, Regulation and Social Dimensions of Agrobiotechnology

Regulatory framework, biosecurity and intellectual property.
Health, socio-economic and environmental impacts.
Ethical Considerations and Public Perception.

EDUCATION ACTIVITIES

Participatory expository classes: Promotion of interactive theoretical classes as far as possible and with the raising of questions and discussion during development.
Seminars, round tables, tutorials, debates, etc. Discussion and question resolution forums available for interaction with the teacher and among students, discussion of related scientific articles. Impact of Plant Biotechnology on the media
Carrying out bibliography/laboratory work of an individual/group nature. The students will do work that will be presented in class, with the rest of the students acting as a forum for debate.

DISTRIBUTION OF WORK TIME

TEACHER-LED TRAINING ACTIVITIES	INDIVIDUAL WORK
30 Horas	45 Horas

SKILLS

Basic Skills

Students must have demonstrated knowledge and understanding in an area of study that is founded on general secondary education. Moreover, the area of study is typically at a level that includes certain aspects implying knowledge at the forefront of its field of study, albeit supported by advanced textbooks

Students must be able to apply their knowledge to their work or vocation in a professional manner and possess skills that can typically be demonstrated by coming up with and sustaining arguments and solving problems within their field of study.

Students must have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflections on pertinent social, scientific or ethical issues

Students must be able to convey information, ideas, problems and solutions to both an expert and non-expert audience

Students must have developed the learning skills needed to undertake further study with a high degree of independence

To acquire firm theoretical, practical, technological and humanistic training needed to develop professional activity.

To be familiar with the applications of biotechnology in the healthcare, food, agrobiotechnological, environmental and chemical fields.

To be familiar with and apply current legislation governing biotechnological processes and products.

To understand the social, economic and environmental implications of professional activity.

To understand the ethical implications of professional and personal activity.

Capacity for teamwork and group management.

To have acquired the ability for analytical, synthetic, reflective, critical, theoretical and practical thought.

Capacity for problem-solving and decision-making.

To foster a concern for knowledge as a key tool in the personal and professional growth process of a student.

To recognize the mutual influence existing between science, society and technological development in order to strive for a sustainable future.

To develop capacity for and a commitment to learning and personal development.

To develop an ability to search for, take in, analyze, sum up and relate information.

To develop oral and written communication skills.

To acquire the molecular biology and biochemistry knowledge needed to develop biotechnological processes and products.

General Skills

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Capacity for teamwork and group management.

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Specific skills

Describe biotechnological processes for application to the chemical and environmental industry.

To know the methodology of gene transfer in plants and its biotechnological application.

Understand and know how to apply genetic and omic technologies to the plant world.

Ability to communicate the knowledge acquired orally and in writing.

Know how to apply the theoretical knowledge acquired to solving problems and practical cases related to different subjects.

Cultivate an attitude of intellectual concern and search for truth in all areas of life.

LEARNING RESULTS

Biotechnological plant products within the different fields covered by plant biotechnology: why and what they are made for.

Apply (theoretically) the main genetic, genomic, proteomic and metabolomic technologies in the plant world.

Consider the possible role of GMOs in solving real problems. Pros and Cons.

Economic Impact caused by the placing on the market of plant and biotechnological products.

Social Impact caused by the placing on the market of biotechnological plant products.

Scientifically substantiate the Environmental Risks linked to agrobiotechnology.

Scientifically substantiate the Health Risks linked to agrobiotechnology.

LEARNING APPRAISAL SYSTEM

Plagiarism, as well as the use of illegitimate means in evaluation tests, will be sanctioned in accordance with those established in the Evaluation Regulations and the University's Coexistence Regulations.
The final grade for this course will be obtained based on the grades obtained in the evaluation of the following modules. After applying the specified percentages to each block, it will be necessary to obtain at least 50% of the total grade to consider the course approved. The exams will be face-to-face.
ORDINARY EVALUATION SYSTEM (default evaluation system for students in this subject)
SE1: Final theory exam (70%). Evaluation of the contents of the subject It will be necessary to achieve at least 50% of the total grade in order to pass the subject.
SE2: Preparation, presentation and discussion of papers (25%)
SE3: Seminars, participation in the development of classes, carrying out and presenting exercises, tutoring, etc. (5%)
* In blocks where the contrary has not been specified, it will not be necessary to obtain a minimum grade.
** The grades obtained in the blocks passed will be saved for the extraordinary call of the same academic year, but not for the following.
ALTERNATIVE EVALUATION SYSTEM.
Students with academic exemption should contact the teaching team to request to take advantage of this system. The request must be justified and formally made by email to the responsible teachers during the first two weeks of class. If you do not report, you will assume the ordinary evaluation with all that this implies.
In the alternative evaluation system, the following percentages will be applied:
- Final theory exam (80%)
- Work whose guidelines will be established by the teacher (20%).

ETHICAL AND RESPONSIBLE USE OF ARTIFICIAL INTELLIGENCE

1.- The use of any Artificial Intelligence (AI) system or service shall be determined by the lecturer, and may only be used in the manner and under the conditions indicated by them. In all cases, its use must comply with the following principles:

a) The use of AI systems or services must be accompanied by critical reflection on the part of the student regarding their impact and/or limitations in the development of the assigned task or project.
b) The selection of AI systems or services must be justified, explaining their advantages over other tools or methods of obtaining information. The chosen model and the version of AI used must be described in as much detail as possible.
c) The student must appropriately cite the use of AI systems or services, specifying the parts of the work where they were used and describing the creative process followed. The use of citation formats and usage examples may be consulted on the Library website(https://www.ufv.es/gestion-de-la-informacion_biblioteca/).
d) The results obtained through AI systems or services must always be verified. As the author, the student is responsible for their work and for the legitimacy of the sources used.
2.- In all cases, the use of AI systems or services must always respect the principles of responsible and ethical use upheld by the university, as outlined in the Guide for the Responsible Use of Artificial Intelligence in Studies at UFV. Additionally, the lecturer may request other types of individual commitments from the student when deemed necessary.
3.- Without prejudice to the above, in cases of doubt regarding the ethical and responsible use of any AI system or service, the lecturer may require an oral presentation of any assignment or partial submission. This oral evaluation shall take precedence over any other form of assessment outlined in the Teaching Guide. In this oral defense, the student must demonstrate knowledge of the subject, justify their decisions, and explain the development of their work.

BIBLIOGRAPHY AND OTHER RESOURCES

Basic

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Franco Alirio Vallejo Cabrera, Edgar Iván Estrada Salazar. Genetic improvement of plants/Second edition. Palmira: National University of Colombia (Palmira Headquarters). Faculty of Agricultural Sciences. Department of Agricultural Sciences, 2013.

José Ignacio Cubero. Introduction to plant genetic improvement [electronic resource] 2nd. ed. Madrid:Mundi-Prensa, 2003.

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