Universitat Autònoma de Barcelona

2019/2020

Applied Plant Physiology.

Code: 100911
ECTS Credits: 6

Degree	Type	Year	Semester
2500252 Biochemistry	OT	4	0

Contact

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Use of Languages

Principal working language: spanish (spa)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Teachers

Josep Allué Creus
Isabel Corrales Pinart
Carlota Poschenrieder Wiens
Maria Soledad Martos Arias

Prerequisites

None

Objectives and Contextualisation

The general objective of this subject is to introduce the students into the functional mechanisms and techniques, which properly developed, allow improving the yield of the crop plants and their agricultural and industrial applications.

The specific training objectives are:

- Identify the processes that determine the yield of plants of agricultural and industrial interest and their regulation by internal and external factors.
- Acquire an advanced vision of reproduction techniques for plants with a practical purpose.
- Introduce the students to the basic techniques of agricultural biotechnology.
- Introduce the students to the basics of phytochemistry and its application in medicine and industry.

Competences

- Analyse and explain normal physiological processes and alterations in them on the molecular scale, using the scientific method.
- Collaborate with other work colleagues.

- Describe intercellular and intracellular communication systems that regulate the proliferation, differentiation, development and function of animal and plant tissues and organs.
- Describe metabolic routes, their interconnections and their physiological significance, and also understand the mechanisms that regulate their activity to satisfy physiological needs.
- Interpret experimental results and identify consistent and inconsistent elements.
- Manage bibliographies and interpret the information in the main biological databases, and also know how to use basic ICT tools.
- Read specialised texts both in English and ones own language.
- Show initiative and an entrepreneurial spirit.
- Stay abreast of new knowledge of the structure, organisation, expression, regulation and evolution of genes in living beings.

Learning Outcomes

1. Collaborate with other work colleagues.
2. Describe the characteristics and organisation of the genome of the different organelles of the plant cell, and also the coordinated expression of this genome and the functions that derive from it.
3. Describe the genetic characteristics of the principal model organisms in plant genetics.
4. Describe the principal molecular tools available for studies in plant genetics.
5. Explain the molecular bases of interactions between plants and microbial pathogens and resistance responses.
6. Explain the molecular bases of processes related to postembryonic growth and to the mechanisms of adaptation to the environment, including responses to different types of stress.
7. Integrate the function of the principal metabolic pathways within the processes of plant growth.
8. Interpret experimental results and identify consistent and inconsistent elements.
9. Make use of bibliography and databases to prepare seminars.
10. Read specialised texts both in English and ones own language.
11. Show initiative and an entrepreneurial spirit.
12. Use data-analysis software (detection of polymorphisms in DNA of plant samples).

Content

Lectures

- Applied Plant Physiology: field of study; Scientific and social interest
- Plant productivity and yield: Assessment parameters; Conditioning factors
- Genetic potential and its regulation by internal and external factors
    - Internal factors:
        - Reproduction and regulation of development
        - Genetics of reproduction: Sexual reproduction and seed technology
        - Asexual reproduction
        - Reproduction in vitro
        - Genetic improvement
        - Plant biotechnology: methods and applications Secondary metabolism of plants
        - Regulation of growth, use of phytoregulators
    - External factors
        - Biotic
            - Plant-microorganism interaction: pathogenesis of bacterial, viral and fungal diseases
            - Molecular bases of defense
        - Abiotic
            - Essential nutrients and soil fertility.
            - Water relations
        - Optimization of production technologies
        - Sustainable plant production and integrative plant production

Laboratory practices

- In vitro culture techniques
- Assessment of ascorbic acid in fruits
- Effect of herbicides on photosynthetic pigments
- Germination assay
- Effect of the osmotic potential on the seed germination
- Susceptibility of fruits to the fungus *Botrytis cinerea*

Field trips

Visit an agrotechnological research center

Methodology

Lectures

During the lectures, the professor explains the functional mechanisms and techniques that allow to improve the yield of crop plants and their agricultural and industrial applications, establishing the functional and mechanistic relationships clarifying the basic concepts necessary for their understanding. The methodology is mainly based on verbal communication, accompanied by visual schemes. Teacher's direct questions to students during the class are indicative of the student's degree of follow-up. Bibliographical references and other sources of information are given to foster self-study.

Seminars

The main purpose of the seminars in this subject is to promote the knowledge of the general and transversal competences of the students. The teaching methodology is based on the exposition and discussion of a scientific article, written in English.

Students divided into groups have to search for and select an adequate article according to the quality criteria explained by the teacher.

Laboratory practices

Some of the topics covered in the theory class are visualized through laboratory testing. The student became familiar with protocols and techniques of Applied Plant Physiology and have to interpret the results obtained in their own experiments.

The student will be able to access the protocols and guides of practices through the Virtual Campus.

Field trips

A visit to an agrobiotechnology research center

Tutorial

In tutorials in groups or individually, the professor tries to help the students to solve their doubts about the concepts of the subject and guide them in their studies.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lab practice	16	0.64	1, 8
Lectures	28	1.12	2, 5, 6, 7, 9

Seminars	6	0.24	1, 8, 10, 11
Type: Supervised			
Field trip	4	0.16	2, 4, 7
Tutorial	6	0.24	
Type: Autonomous			
Personal study	70	2.8	
Preparation of homework and/or seminars	11	0.44	1, 8, 10, 9
Preparation of lab practice report	5	0.2	1, 7, 8

Assessment

The evaluation is based on the following items:

Written exams that include the evaluation of the contents of the lectures. There will be two eliminatory tests corresponding to the two equitable parts in which the program has been divided.

To be able to pass the subject, a minimum grade of 5 must be obtained in each of these parts. The weight of each partial exam in the theory note is 50%.

The weight of the theory mark in the final grade is 70%.

To improve the mark, or to pass the notes less than 5, you can do a recovery at the end of the course of each of these exams in a final examination of recovery. The minimum mark to pass this exam is 5.0

To be eligible for this retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module. Thus, the student will be graded as "No Evaluable" if the weight of all conducted evaluation activities is less than 67% of the final score.

If you present yourself to improve your note you waive the previously obtained note and only the note of the recovery exam will be counted.

Laboratory practices will be evaluated by means of a theoretical exam that will be done on the last day of practices together with the presentation of the script in which the results obtained individually for each student will be discussed.

The lab practice note represents 20% of the final mark of the subject. Attendance is mandatory. In the event of justified absence, a lab session can be recovered through assistance to another group or, if that is not possible, by means of a substitute work. There is no practice recovery exam.

Seminars: Participation in the seminars and the quality of the works and / or problems resolved and presented will account for 10% of the final mark. Theseminars will consist of group presentations before the class of a scientific article in English; student's presentations in English will be awarded. Seminars cannot be retaken.

The subject of Applied Plant Physiology will be passed when the student fulfills the above conditions and the resultant note of the different evaluations (exams, practices and seminar) is 5.0.

The presentation to the final examination of recovery in any case means that the student has presented and will be evaluated.

Students who cannot attend an individual assessment test for just cause (such as illness, death of a first-degree relative or accident) and provide the official documentation corresponding to the Degree Coordinator, will have the right to perform the test In question on another date.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation of lab practice	20%	1	0.04	1, 8
Evaluation of seminar	10%	0	0	1, 10, 9, 11
Examinations of lecture program	70 %	3	0.12	3, 2, 4, 5, 6, 7, 12

Bibliography

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JIMENEZ DIAZ, R; LAMO DE ESPINOSA, J. : Agricultura Sostenible. Mundi Prensa, 1998.

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