Universitat Autònoma de Barcelona

2022/2023

Applied Mycology

Code: 100826
ECTS Credits: 6

Degree	Type	Year	Semester
2500251 Environmental Biology	OT	4	1

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Sergio Santamaria del Campo

Prerequisites

This subject is complementary to the subject of Mycology, and deals with its most applied aspect. Therefore, it is requested to do a previous review to follow the subject correctly.

We may also refer to botanical issues, which is why it is interesting to keep this matter in mind.

In order to be able to attend the practices, the student must justify having passed the biosafety and security tests that he will find on the Virtual Campus and be

knowledgeable and accept the operating regulations of the Bioscience Laboratories

Objectives and Contextualisation

Objectives and contextualization

The subject of applied myology must be understood as complementary to the subject of Mycology (3rd year). The constant references that are made to groups and fungal species require a mycological basis that facilitates the understanding of the syllabus. We will develop several aspects of fungal biotechnology, a very wide and varied field, and with numerous interconnections that often hamper the thematic partition. The proposed objectives are:

1.- Understand the importance of fungi in natural ecological systems as well as in the development and economics of human civilization, in the various industries in which they participate.

2.- To interpret the role of various fungi (especially lichen) in the biomonitoring of environmental quality (fungi as bioindicators)

3.- Understand fungal biotechnological processes in different industries and applications.

4.- Obtain the importance of fungi as a source of alternative resources and renewable energy.

5.- Understand / visualize the diversity of fungal pathological processes, both from the animal and human and vegetable aspects.

6.- Obtain the bases to develop systems of biocontrol with fungal agents.

7.- To capture the need for basic and applied mycology studies to allow the development of various applied disciplines, especially biomedical, pharmaceutical, agricultural and forestry sciences.

8.- Obtain a global vision of fungi, from the perspective of its "destructive" role as from its "creator" role.

Competences

- Apply knowledge of theory to practice.
- Develop analysis and synthesis skills.
- Develop and apply biological control techniques.
- Develop bioassays and apply biotechnological processes.
- Identify and use bioindicators.
- Perform biological diagnoses.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.

Learning Outcomes

1. Apply knowledge of the biology and distribution of certain species of fungi, such as the lichens, in order to use them as bioindicators of contamination and other environmental impacts.
2. Apply knowledge of theory to practice.
3. Apply the metabolic processes of fungi in industry.
4. Develop analysis and synthesis skills.
5. Identify and treat the principal diseases caused by fungi: their symptoms and the corresponding biological cycles.
6. Recognise and apply techniques for the biological control of pests and populations, making use of fungi.
7. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.

Content

Contents

The subject is structured in 6 blogs and 19 topics:

I-. Introduction.

1-. Fungi in the Biosphere

II-. Fungi in environmental biotechnology

2- Biodeterioration

Concepts: biodegradation, biodeterioration and bioremediation. Biodeterometer of inorganic and organic compounds (paper, paint, leather, glass, polystyrene, cables, tubes, etc.). Responsible

Biodeterioration of wood. Composition of wood. White rot (rot) or fibrous rot and brown (rot) or cubic rot. Dry rot (dry-rot) and wet rot (wet-rot). Responsible Chromogenic fungi.

3- Bioremediation

Introduction. Concepts

Degradation of lignin by "white-rot" fungi and its implications for bioremediation. What are phenols? Enzymatic equipment of ligninolytic fungi. Phanerochaete chrysosporium.
Degradation of organic pollutants. Use in the paper industry. The Kraft process and the alternatives. Biopulping. Biobleaching. Burglary of heavy metals.

II-. Fungi in agricultural and forestry systems

4- Phytopathology: fungi as phytopathogenic agents.

Introduction. Concepts The science of Phytopathology. A bit of history.

Parasitism and pathogenicity. The cycle of the disease or the pathogenesis. Inoculation Preperetration. Gene-to-gene hypothesis. Penetration
Infection. Dissemination. Survival during winter (overwintering) or during the summer (oversummering) of pathogens. Defenses of plants. Control of diseases.

Phytopathogenic fungi. Isolation Classification of mycosis.

5- Biological control: fungi as agents of biological control

Concepts Problems of Biocontrol. Advantages and disadvantages of fungi such as BCA. The Entomopathogen Fungi. Herbicides fungus. Fungi fungi.

6- Mutual Mushrooms: Endophytes and Mycorrhizae in agricultural and forestry systems. Introduction to mutualist fungi.

The Endophytes Mushrooms. Chemical synthesizers within the plants. Aspects of agricultural and livestock interest.

The Mycorrhiza. Definition and interest. Types of mycorrhiza. Plants without mycorrhiza.

Uses and applications of mycorrhizas.

7.- Lichens as bioindicators of environmental quality and other applications

Characteristics of symbiosis. Indicators of atmospheric quality. As a source of food Producers of secondary metabolites. Other applications.

IV-. Fungi and food biotechnology

8- Introduction.

Definition Types of fermentations. History Applications

9-. Production of alcoholic beverages and the bread industry

Wine industry (wine and cava). Beer industry. Other alcoholic beverages. Alcoholic fermentation of milk: kefir.

10-. Alcoholic fermentation in the cocoa and coffee industry

11-. Lactic fermentation Cheese industry

12-. Koji fermentation.

Oriental products. Sake. Shoyu. Tempeh. Tofu Miso.

13-. Mycophagia The cultivation of mushrooms. Medicinal mushrooms

Mycophyllia and Mycofobia. "The Hunters of Mushrooms".

Cultivation of Mushrooms. Examples. How to grow mushrooms. Cultivation of mushroom and shiitake. Medical use of mushrooms.

V.- Mushrooms as producers of metabolites of interest in the food and drug industry

14-. Primary metabolites. Definitions of primary and secondary metabolites. Alcohols. Organic acids. Vitamins. Carotenoids. Polysaccharides

15-. Secondary metabolites. Antibiotics Non-β-lactam antibiotics. Immunosupressors. Hypercholesterolemia. Antitumorals. Antidiabetic

VI-. Medical mycology

Diseases produced by fungi. Poisoning. Allergy. Mycosis

16-. Poisons: Mythologies:

Poisoning for the consumption of mushrooms. Classification of mushroom poisoning: shortincubation and long incubation.

17-. Mycotoxicosis:

Introduction. The origin of mycotoxins: the biodeterioration of food. The people in charge Prevention of fungal growth. Raw and prepared foods.

Notable toxins: ergotism, aflatoxins, ocratoxins, tricotecens, fumonisines, etc.

18-. Fungi and allergy. The Micosis. Superficial mycosis Cutaneous mycosis Subcutaneous mycosis. Deep mycosis.

Methodology

he subject of APPLIED MICOLOGY will be structured from the theoretical classes, from which a series of proposals for complementary training activities will be dealt with:

1) THEORETICAL CLASSES: - They will be taught in the form of master lectures made with the help of ICT tools, and complemented with the teaching material prepared for this purpose and accessible to students in the Virtual Campus of the UAB. Class participation will be encouraged in the form of interventions and debates.

The student will have to complement the subjects explained with the personal study, and can resort to personalized tutorials in accordance with the requirements that the student and the professor consider necessary.

2) SEMINARS: - There will be 8 sessions of seminars that will be assigned at the beginning of the course. The participation is obligatory. In these sessions, combined activities of self-learning and directed work will be carried out in which subjects treated in class or complementary topics will be expanded. The format of these activities may vary from the following:

- Oral presentations (ppt or poster format). Group work that will be exhibited in a specific time (20-25 min) by presentation ppt to the rest of the class-seminar. The subject will be chosen by the group among various proposals made by the teacher or generated by the students themselves.

3) PRACTICAL SESSIONS: The practices allow to visualize concepts and processes explained in the theoretical classes, manipulate the microorganisms with the appropriate instruments, prepare and maintain fungal crops, etc. The 3 practice sessions have a duration of 3 hours and the teacher will guide the whole of the practice with the help of support material (scripts, ppt presentations, etc.).

4) EXTERNAL VISIT: An exit to an industry / cooperative dedicated to the transformation of foods through yeasts (eg, caves) will be carried out. The microbiological / mycological aspect of the process, the methodology, the dynamics and the specific needs of the yeasts, the process of transformation from a biochemical and biological perspective, the incidence of phytopathogenic fungi in the vineyards, ecological treatments for the handling of fungal pests, etc.

4) TUTORIES: -To resolve doubts / problems that arise during the self-learning process, assignment tasks or theoretical classes. They will be done individually or in small groups depending on the requirements and the areas of the issues to be discussed. The place of completion and the schedule will be taken by mutual agreement between the teacher and the student (s) concerned.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory sessions	9	0.36	1, 2, 5, 6
Theory	30	1.2	1, 3, 5, 6
Visit in a related organism/ industry	5	0.2	2, 3, 4
Type: Supervised			
Personal work, interactive tools, forum	6	0.24	4
Seminars	8	0.32	1, 2, 3, 4, 5, 6
Type: Autonomous			
Personal work (includes: study, group work, bibliographic research, participation in the forum, etc.)	89	3.56	2, 4

Assessment

he subject will be evaluated based on the notes obtained in the two eliminatory partial examinations (with recovery), in the seminars and in the practices, as detailed below:

1) 1st PART EXAM. Assess the corresponding theoretical part by means of an eliminatory test, with questions of type test and / or short answer.

A minimum score of 5 is nedded to pass. This partial represents 30% of the total subject score

2) 2nd PART EXAM. Assess the corresponding theoretical part by means of an eliminatory test, with questions of type test and / or short answer.

A minimum score of 5 is nedded to pass. This partial represents 30% of the total subject scoreubject.

3) RECOVERY EXAM. Only those who have to recover one or two partial exams will have to submit it. It will have the same structure as the partial examinations and will have the same weight (30% each block). It will be necessary to approve each partial with a minimum of 5 to be able to pass the subject. No compensation

To participate in the recovery, the students must have been previously evaluated in a set of activities whose weight equals to a minimum of two thirds of the total qualification of the student, subject or module.

4) SEMINARS. The evaluation of the seminars will count 20% of the final Note. The defense of the oral presentation will be evaluated (85%), and the preliminary work (15%)

5) PRACTICAL SESSIONS. The assistance is obligatory. During the course of the practices, a continuous assessment of the student will be carried out, taking into account the attitude (max 10% of the score) and the progress. The sudent progress will be assessed through the delivery of a report at the end of the course (70% 0f the score).

Visit to a related-indusrty. At the end of the exit a test will be done to evaluate the sudents (20%).

The whole practice block will count 20% of the final mark.

It is necessary to overcome each of the blocks (theory, seminars and practices) with aminimum of 5 to be able to compensate.

A student will receive the non-evaluble qualification when the assessment activities carried out have a weighting of less than 67% in the final qualification ".

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
1rst Part Theory	30	1.5	0.06	7, 1, 2, 4, 5, 6
2nd part Theory	30	1.5	0.06	1, 3, 4
Laboratory sessions	20	0	0	7, 2, 3, 4, 5, 6
Seminars	20	0	0	7, 1, 2, 3, 4, 5

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Software

We won't use any specific program