

Syllabus

Subject

Subject / Group	11235 - Applying Biotechnology to Pest Control / 1
Degree	Master's Degree in Applied Biotechnology
Credits	5
Period	Second semester
Language of instruction	English

Professors

Lecturers	Office hours for students					
	Starting time	Finishing time	Day	Start date	End date	Office / Building
Miguel Ángel Miranda Chueca ma.miranda@uib.es	You need to book a date with the professor in order to attend a tutoring session.					

Context

To date Plant Pest Management requires the integration of several areas of knowledge, including Entomology, Chemistry and Biochemistry, GIS management, Economy and Agricultural Engineering among others. The use of Biotechnology for pest management in the last 20 years has been focused on the production of pathogens, natural enemies and semiochemicals that have improved notably the control of key economical pests. The use of those biotechnological products has enormously contributed to decrease the impact of plant pest management methods on human health and the environment.

The subject Biotechnology and Pest Control therefore focuses on the use of organisms and bioproducts for pest control, including Biological Control by using entomopathogens, the use of the Sterile Insect Technique and the development of genetically engineered pest control agents.

Requirements

It is recommended to have basic background on Zoology and Entomology.

Skills

Specific

- * Diseñar y gestionar proyectos de base biotecnológica. Adquirir conocimientos, destrezas y actualización en el uso de tecnologías avanzadas para la ejecución de proyectos de I+D+i, así como dotar al alumno de las herramientas necesarias para resolver problemas en un entorno multidisciplinar. Adquirir una base formativa sólida para iniciar una carrera investigadora a través de la realización del Doctorado o para

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desarrollar tareas profesionales especializadas en el ámbito de la Biotecnología que no requieran del título de Doctor. .

- * Conocer las aplicaciones de la biotecnología al desarrollo sostenible. Saber evaluar y gestionar la biodiversidad, los recursos naturales y los servicios de los ecosistemas mediante tecnologías avanzadas que contemplen los principios del desarrollo sostenible en los hábitats mediterráneos. Conocer los avances tecnológicos que permiten una mejora de la producción de plantas y cultivos en condiciones mediterráneas y ser capaz de desarrollar nuevas tecnologías aplicadas al estudio de los principales procesos productivos vegetales para la mejora de su eficiencia. Capacidad para el diseño y análisis de experimentos. Capacidad para plantear, preparar y ejecutar estudios y trabajos de campo. .

Generic

- * Nota: a falta de una traducción oficial al Inglés de las competencias, se ha optado por dejar las originales en castellano. Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación. Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio B3 Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios B4 Que los estudiantes sepan comunicar sus conclusiones –y los conocimientos y razones últimas que las sustentan– a públicos especializados y no especializados de un modo claro y sin ambigüedades .

Basic

- * You may consult the basic competencies students will have to achieve by the end of the Master's degree at the following address: http://estudis.uib.cat/master/comp_basiques/

Content

Range of topics

Theme 1. Organisms and bioproducts for pest control. Biological control

Biological control: entomopathogens (nematodes, bacteria, fungi, viruses and protozoa); predators and parasitoids. Mass production of natural enemies. Strategies of application of natural enemies in field conditions. Examples of national and international programs of implementation of pest control using mass produced entomopathogens and natural enemies.

Theme 2. The Sterile Insect Technique

Principles of the Area-Wide Integrated Pest Management. Introduction to the Sterile Insect Technique (SIT). Biological basis of the SIT programs. SIT Cost- effectiveness analysis. Pest and beneficial insects mass-rearing facilities. Monitoring of SIT programs. Area Wide Strategies in using SIT. National and international examples of using SIT for pest control.

Theme 3. Bioproducts: bioactive natural products for pest control.

Introduction to the use of Semiochemicals and Bioinsecticides for pest control. The role of Semiochemicals in insect behaviour and biology. Origin and development of bioinsecticides and its application in field conditions. Bioassays using bioinsecticides and semiochemicals. Application of semiochemicals and pheromones: Pest monitoring; Mass trapping; Lure and Kill; Mating disruption; Behaviour Modifiers Semiochemicals

Theme 4. Genetically modified organisms for pest control.

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Genetically modified crops vs. conventional insecticides. Examples of using GMO crops: disease resistant and insect resistant crops. Socioeconomical implications of GMO use for pest control. Development of GM insects for vector and parasite control. Regulatory aspects of genetically engineered control agents.

Teaching methodology

In-class work activities (1.2 credits, 30 hours)

Modality	Name	Typ. Grp.	Description	Hours
Theory classes	Lectures	Large group (G)	To provide cutting-edge knowledge about the application of Biotechnology in pest control. To promote general and specific skills acquisition in the students considering interdisciplinary contents. Lectures will be conducted by using all available technology. Active participation of students would be encouraged.	20
Seminars and workshops	Workshop	Medium group (M)	To develop criteria for analysis of key information in regards to Biotechnology and Pest Control. To promote scientific communication skills among students Workshop-like meetings will be organized in key topics to promote dialogue and provide the scenario to use self criteria.	10

At the beginning of the semester a schedule of the subject will be made available to students through the UIBdigital platform. The schedule shall at least include the dates when the continuing assessment tests will be conducted and the hand-in dates for the assignments. In addition, the lecturer shall inform students as to whether the subject work plan will be carried out through the schedule or through another way included in the Aula Digital platform.

Distance education tasks (3.8 credits, 95 hours)

Modality	Name	Description	Hours
Group or individual Reports self-study		To carry out an academic search on information about Biotechnology and Pest Control topics to be discussed during the workshops. To know appropriate methods of presenting and communicate scientific information in relation with the topics covered. Students will work in the report that will be presented and discussed during the workshop sessions.	95

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Specific risks and protective measures

The learning activities of this course do not entail specific health or safety risks for the students and therefore no special protective measures are needed.

Student learning assessment

Frau en elements d'avaluació

In accordance with article 33 of Academic regulations, "regardless of the disciplinary procedure that may be followed against the offending student, the demonstrably fraudulent performance of any of the evaluation elements included in the teaching guides of the subjects will lead, at the discretion of the teacher, a undervaluation in the qualification that may involve the qualification of "suspense 0" in the annual evaluation of the subject".

Lectures

Modality	Theory classes
Technique	Other methods (retrievable)
Description	To provide cutting-edge knowledge about the application of Biotechnology in pest control. To promote general and specific skills acquisition in the students considering interdisciplinary contents. Lectures will be conducted by using all available technology. Active participation of students would be encouraged.
Assessment criteria	The students need to demonstrate a good knowledge of the different topics covered by the course The student must pass a test that will consist on questions based on theory and practical approaches.

Final grade percentage: 30%with a minimum grade of 5

Workshop

Modality	Seminars and workshops
Technique	Other methods (retrievable)
Description	To develop criteria for analysis of key information in regards to Biotechnology and Pest Control. To promote scientific communication skills among students Workshop-like meetings will be organized in key topics to promote dialogue and provide the scenario to use self criteria.
Assessment criteria	The student must show a good capacity to communicate and elaborate scientific information about the topics related to the workshop. Capacity for organizing and presenting information will be also assessed.

Final grade percentage: 20%with a minimum grade of 5

Reports

Modality	Group or individual self-study
Technique	Papers and projects (retrievable)
Description	To carry out an academic search on information about Biotechnology and Pest Control topics to be discussed during the workshops. To know appropriate methods of presenting and communicate scientific information in

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relation with the topics covered. Students will work in the report that will be presented and discussed during the workshop sessions.

Assessment criteria The students must present a written report according to the course rules and procedures. Accuracy and scientific relevance of the information provided will be assessed. The use of highly value scientific references in coherent manner will be basic to pass this course.

Final grade percentage: 50%with a minimum grade of 5

Resources, bibliography and additional documentation

Basic bibliography

Caballero, P. Bioinsecticidas : fundamentos y aplicaciones de *Bacillus thuringiensis* en el control integrado de plagas. Navarra : Universidad Pública, 2001
Dyck, V.A., Hendrichs, J., Robinson, A.S. (Eds. Sterile Insect Technique) Principles and Practice in Area-Wide Integrated Pest Management. Springer
García Marí, F., Ferragut Pérez, F. Las plagas agrícolas. Valencia : Phytoma, 2002
Howse, P. E., Stevens, I.D.R., Jones, O.T. . Insect pheromones and their use in pest control. London : Chapman and Hall, 1993.
Jacas, J.A. and Urbaneja, A. Control biológico de plagas agrícolas. Phytoma, 2008

Complementary bibliography

Additional references will be provided through Campus Extens.

Other resources

Additional resources will be provided through Campus Extens.