COURSE DATA

Data Subject	
Code	33198
Name	Molecular techniques in genetic improvement
Cycle	Grade
ECTS Credits	4.5
Academic year	2021 - 2022

Study (s)

Degree	Center	Acad. year	Period
1102 - Degree in Biotechnology	Faculty of Biological Sciences	4	Second term

Subject-matter

Degree	Subject-matter	Character
1102 - Degree in Biotechnology	108 - Molecular techniques in genetic improvement	Optional

Coordination

Name	Department
ESCRICHE SOLER, BALTASAR	194 - Genetics

SUMMARY

The subject "Molecular Techniques in Plant Breeding" is taught in the module of optional subjects in the fourth year of the Bachelor of Biotechnology, Basic knowledge about the molecular markers and their heritage, as well as concepts of population genetics will have been obtained in the core subject 2nd year called Genetics. Subjects like "Getting Transgenic Organisms" (trunk) and "food biotechnology" (optional) have descriptors with content overlapping the those of the present subject, but specifically applied to animals or microorganisms, So, considering this, the subject has been raised primarily a non-exclusive, but priority approach, focusing on plant breeding. From this perspective, the subject has been coordinated with the subject "Plant Biotechnology" (optional), with which it has certain similar descriptors, so that although there is some repetition (both are optional subjects), each subject provide different escalations.
Students should begin taking general knowledge of Molecular Biology and Genetics. The aim of this course is that the student deepens basics of breeding techniques, mainly using molecular markers.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

OUTCOMES

1102 - Degree in Biotechnology

- Determinar los marcadores moleculares apropiados en procesos de mejora con fines biotecnológicos.
- Diseñar procesos de manipulación y obtención de productos biotecnológicos.
- Analizar a nivel molecular el resultado de la manipulación de un organismo.
- Diseñar y aplicar aproximaciones biotecnológicas en el campo de la Agroalimentación.

LEARNING OUTCOMES

- Determine appropriate molecular markers in improvement processes.Designing handling processes and obtaining genetically improved organisms.
- Analyzing process at the molecular level and the result of selection of an organism.Design and implement breeding approaches in the field of agroalimentación
- Capacity to work together when facing problematic situations collectively.
- Ability to argue with rational criteria, clearly differentiating what is debatable what are facts or scientific evidence.
- Analisis and synthesis capacity.
- Create a critical attitude that allows them to issue judgments and argued vigorously defend and tolerance.
- Transmit the knowledge acquired in the subject to other professionals and laymen adapting the appropriate language to address the subject receptor.
- Ability to get obtain adequate information with which to address the scientific issues that arise.
- Ability to build a comprehensive and organized written text
- Professional training.
- Much of the contents of the course aims to develop in students the ability to confront and solve problems related to DNA, genes and genetic improvement.

DESCRIPTION OF CONTENTS

1. Topics

1. Introduction.
2 DNA markers.
3 Analysis of linkage with molecular markers.
4 Power selection by molecular markers.
5 Molecular markers for selection of quantitative traits.
6 Cartogarfiado markers.
7 Analysis of genetic variation in populations.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	21,00	100
Laboratory practices	15,00	100
Tutorials	9,00	100
Development of individual work	22,50	0
Preparation of evaluation activities	20,00	0
Preparing lectures	22,00	0
Preparation of practical classes and problem	3,00	0
TOTAL	**112,50**	

TEACHING METHODOLOGY

The teaching of this subject will be made through the following methodological approaches: lectures, discussion sessions organized by the contents of the syllabus of the subject tutorials and laboratory work experience.
The student must attend the lectures in which he will give an overview of the topic, especially focusing on key concepts. At the same meeting will be indicated the most suitable for a deepening of the subject resources so that students complete their training in it. As for the practical classes experiments in which the concepts developed in the theoretical classes will be planted.
The subject is devised to be developed in the form of classroom and non-contact work.

EVALUATION

The assessment of student learning assessment will be made by the following sections:
1) A written exam in single call to be held in the classroom and consisting of both knowledge questions on theory and exercises that need to be resolved, must obtain a score equal to or greater than 5 out of 10. This test will be worth 60% of the grade and will be held after the end of classes.

2) Assessment of the resolution of practical exercises by the students along the course as well as memory

care and practices. This section will be worth 30% of the grade.

3) A work about markers will account up 10% of the final grade for the course.

The final grade for the course will be the sum of that obtained in the evaluation of theoretical credits of course work and additional activities as organized discussions, as previously described relations 60%, 30% and 10% respectively. It will approve the course with a grade greater than 5 out of 10, as long as you have exceeded in paragraphs 1 and 2 score of at least 4 out of 10.
To pass the course on the second call, we must pass a written exam only similar to that proposed in section XI-1. In the event that the student had obtained a score equal to or greater than 1.5 on the practice (see chapter XI-2) these points will join the exam, which will be worth up to 7 points. In the event that the scoring tasks paragraph XI-2 is less than 1.5 or is absent, the value of the review will be up 10 points.

REFERENCES

Basic

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Avise, J.C. (2004) Molecular markers, natural history and evolution. 2nd edition. Sinauer Associates.
Benito Jiménez , C. y Espino Nuño, F.J. (2013), Genética: conceptos esenciales, Editorial Médica Panamericana
Cubero, J.L. (2013) Introducción a la mejora genética vegetal. Ediciones Multi-Prensa.
de Vienne, D. (2003). Molecular Markers in Plant Genetics and Biotechnology. Science Publishers Inc.
Griffiths, A.J.F.; Wesier, S.R., D.T.; Lewontin, R.C. and Carroll, S.B. (2013) Genética. 9ª ed. Interamericana-McGraw-Hill.
Klug, W., Cummings, M.R. and Spencer C.A. (2013) Conceptos de Genética. Pearson Prentice Hall, 10ªed.
Krebs, J.E.; Goldstein, E.S.; Kilpatrick, S.T.; Lewin, B. Genes XI. (2014) Burlington, Mass.
Nuez, F. y J.M. Carrillo (eds.).(2000) Los marcadores genéticos en la mejora vegetal. Ed. Universidad Politécnica de Valencia.
Phillips, R.L.; Vasil, I.K. (2001) DNA-Based Markers in Plants. Advances in Cellular and Molecular Biology of Plants Vol.6 2nd ed. Springer Verlag.
Pierce, B.A. (2016) Genética. Un enfoque conceptual. 5ª edición. Panamericana.
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Additional

- Crossa J, Pérez-Rodríguez P, Cuevas J, et al. Genomic Selection in Plant Breeding: Methods, Models, and Perspectives. Trends Plant Sci. 2017;22(11):961-975. doi:10.1016/j.tplants.2017.08.011
Huang X, Han B. Natural variations and genome-wide association studies in crop plants. Annu Rev Plant Biol. 2014;65:531-551. doi:10.1146/annurev-arplant-050213-035715
Elshire RJ, Glaubitz JC, Sun Q, et al. A robust, simple genotyping-by-sequencing (GBS) approach for high diversity species. PLoS One. 2011;6(5):e19379. Published 2011 May 4.

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Lenaerts B, Collard BCY, Demont M. Review: Improving global food security through accelerated plant breeding. Plant Sci. 2019;287:110207. doi:10.1016/j.plantsci.2019.110207

Liu HJ, Yan J. Crop genome-wide association study: a harvest of biological relevance. Plant J. 2019;97(1):8-18. doi:10.1111/tpj.14139

Quantitative Genetics, Genomics and Plant Breeding 2nd Edition. 2020. Edited by: Manjit Kang, Kansas State University, USA

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

The distribution of teaching and the relationship between presencial and non-presencial activities may be modified throughout the course if health conditions require it.