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|------------------|--|---------------|----------------|--------------------------|-------|
| Course Unit | Biotechnology and genetic resources conservation | | Field of study | Biology and biochemistry | |
| Bachelor in | Biology and Biotechnology | | School | School of Agriculture | |
| Academic Year | 2022/2023 | Year of study | 3 | Level | 1-3 |
| Type | Semestral | Semester | 2 | ECTS credits | 6.0 |
| Code | 9029-510-3201-00-22 | | | | |
| Workload (hours) | 162 | Contact hours | T 30 | TP - | PL 30 |
| | | | TC - | S - | E - |
| | | | OT 4 | O - | |

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Ana Maria Pinto Carvalho, Vasco Augusto Pilão Cadavez

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. To master basic concepts of genetic resources conservation considering the importance of diversity, biotechnological advances and techniques used to assess populations variability and species
2. To identify and apply methods and techniques for the conservation of plant and animal genetic resources
3. To understand the mechanisms, as well as the advantages and disadvantages of in-situ and ex-situ conservation
4. To be aware about national, international and European regulations and to identify several current conservation guidelines and programmes
5. To identify and recognize the leading institutions for the conservation of plant and animal genetic resources

Prerequisites

Before the course unit the learner is expected to be able to:
To master the principles of plant and animal biology

Course contents

Conservation and breeding. Diversity and sources of genetic variability. Inbreeding and inbreeding depression. Genetic erosion. Mechanisms of extinction. Species rehabilitation, conservation and management of diversity. The role of biotechnology in genetic resources conservation. Methods and techniques for conservation. Genetic diversity conservation guidelines and programs. Genebanks. Breed registry and herd books. Databases and information networks. Legislation and regulations

Course contents (extended version)

1. Biology and conservation of genetic resources
 - Biodiversity. The Origins of Conservation Biology. Arguments for Preserving Biological Diversity
 - Genetic variation, ecosystem variation, or species variation (number of species)
 - Genotype and phenotype. Heritability and repeatability coefficient
 - Qualitative, quantitative traits, transmission. Aptitude. Productive, reproductive performance
 - Origin and significance of genetic variation. Inbreeding and inbreeding depression
 - Genetic erosion. Vulnerability. Habitat destruction, fragmentation, degradation, changes
 - Overexploitation, invasive species, diseases, global climate change
2. Conservation and breeding
 - Essential concepts for small populations
 - Selection of breeds/strains, mating methods, crossbreeding. Selective breeding and genetic material
 - Animal genetic resources programmes and populations management. Breed registry and herd books.
 - Red list of threatened species
3. Animal genetic resources
 - Origin of the main domestic species. Migratory paths. Species diffusion. Breeds
 - Portuguese breeds. Census and characteristics of the populations
 - Animal identification: significance and methods
 - Optimizing the management and use of animal genetic resources
 - Specific products: organic certification, geographical indication (GI), designation of origin (DO)
4. Agricultural biodiversity and plant genetic resources conservation
 - Centres of origin of cultivated plants. Domesticated crops and crop wild relatives
 - Agroecosystem services. Pollinators, soil microbiota, carbon sequestration, water and soil resources
 - Neglected and underutilized crops. Landraces
 - Importance and value of plant genetic diversity. Key steps in conservation and use of PGR resources
5. Methods and techniques for genetic resources conservation
 - Technologies for collection and conserving genetic material. Molecular and genetic tools.
 - In-situ and ex-situ conservation. Ways of valuing and monitoring plant genetic diversity.
 - Community-based management of animal and plant genetic resources
 - Genebanks. Characteristics and types of germplasm. Monitoring and management tools
 - Protected areas, networks and biological reserves, conservation in captivity
6. Global strategy for genetic resources conservation. The role of FAO
 - National and European regulations. Networks, programmes and projects
 - International treaty on plant genetic resources for food and agriculture
 - The global plan of action for animal genetic resources
 - International legal framework on animal/plant genetic resources

Recommended reading

1. Primack R. B. (2010). Essentials of Conservation Biology. 5th revised edition. Sinauer Associates, INC. Sunderland, Massachusetts. USA.
2. Pandit M. W., Shivaji S., Singh L (2007) You Deserve. We Conserve: A Biotechnological Approach to Wildlife Conservation. K. International Pvt Ltd
3. Dulloo, E.M. (ed.) (2021) Plant genetic resources: A review of current research and future needs. <https://shop.bdspublishing.com/store/bds/detail/workgroup/3-190-89127>
4. FAO (2022). The State of Food and Agriculture 2022. available at <https://doi.org/10.4060/cb9479en>. Other FAO Web pages available at <http://www.fao.org/nr/cgrfa/cgrfa-home/en/>
5. FAO (2020). How the world's food security depends on biodiversity. CB0416EN/1/07. 20. Rome, Italy. <https://www.fao.org/publications/card/en/c/CB0416EN/>

Teaching and learning methods

Theoretical-practical lessons within 7 weeks. Lectures on basic concepts. Short papers on selected topics and web searching. Guided reading. Oral presentations of the main topics, illustrated with practical examples and problems to increase group discussion and participation. TIC, namely e-learning, and both auditory and visual stimuli are used to promote augmented learning.

Assessment methods

1. Coursework assesement - (Regular) (Final)
 - Case Studies - 40% (Guided reading and text summaries to be orally presented and discussed)
 - Development Topics - 60% (Written report about a selected topic and oral presentation)
 - Intermediate Written Test - 60% (Written test on selected course contents, insted of the report proposed in b))
2. Final examination on course contents - (Regular, Student Worker) (Final, Supplementary, Special)
 - Final Written Exam - 100% (Final examination on course contents)

Language of instruction

Portuguese

Electronic validation

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|--|-------------------------|------------------------|---------------------------|
| Ana Maria Pinto Carvalho, Vasco Augusto Pilão Cadavez | Ana Maria Antão Gerales | Altino Branco Choupina | Ramiro Corujeira Valentim |
| 07-12-2022 | 07-12-2022 | 07-12-2022 | 19-12-2022 |