

Course Unit	Culture of Cells and Tissue	Field of study	Biology and biochemistry
Bachelor in	Biology and Biotechnology	School	School of Agriculture
Academic Year	2019/2020	Year of study	3
Type	Semestral	Semester	1
Level	1-3	ECTS credits	6.0
Code	9029-510-3104-00-19		
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) Anabela Rodrigues Lourenço Martins, Manuel Ricardo Costa Calhelha, Maria João Almeida Coelho Sousa

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
Mastering the concepts of cell totipotency, dedifferentiation and morphogenesis. The applications of Cell Culture and techniques, equipment and methods of operation in asepsis.

Prerequisites

Before the course unit the learner is expected to be able to:
Skills of Cellular and Molecular Biology, Genetics, Physiology and Biochemistry. English recommended

Course contents

History of the culture of cells and tissues: Cell totipotency, dedifferentiation and organogenesis. Plant Cell Culture: Culture conditions and its physiological effects. Types of culture and its applications. Applications for the production of plants and improved synthesis of new products. Application of PCC in agricultural production, forestry and biotech industries. Animal Cell Culture: Biology of Animal Cells: Interaction cell. Culture and subculture of animal cells.

Course contents (extended version)

1. History of the culture of cells and tissues.
 - Cell totipotency, dedifferentiation and organogenesis.
2. Plant Cell Culture: Cell totipotency, dedifferentiation and organogenesis.
3. Conditions of culture and its physiological effects. Types of culture and its applications.
 - Direct and indirect morphogenesis and somatic embryogenesis. Production of artificial seed.
 - Culture of anthers and pollen to produce haploids. Protoplasts culture and somatic hybridisation.
4. Somaclonal and epigenetic variation. In vitro cultures of organs, tissues and cells in suspension.
5. Cell culture and genetic engineering - plant transformation.
 - Applications for the production of plants and improved synthesis of new products.
 - Application of PCC in agricultural production, forestry and biotech industries.
6. Animal Cell Culture: Biology of Animal Cells: Cell interactions.
 - Culture and subculture of Animal Cells: Isolation, primary cultures, cell lines.
 - Evolution and maintenance of Finite Cell Lines (FCL) and Continuous (CCL)
 - Transformation of animal cells in vitro. Animal cloning of cells.
 - Characterization of Cell Lines: Analysis of karyotypes. Scaling-Up. Applications. Bioassays.
7. Practical Contents
 - 1 - Introduction to equipment and laboratory equipment for in vitro culture;
 - 2 - Maintenance of aseptic conditions;
 - 3 - Composition and preparation of culture media;
 - 4 - Induction of dedifferentiation;
 - 5 - Multiplication of plants by micropropagation;
 - 6 - Cultures in liquid medium;
 - 7 - somatic embryogenesis;
 - 8 - Induction of direct and calli morphogenesis;
 - 9 - Bioassays;
 - 10 - Treatment of results.

Recommended reading

1. (1) Chawla H. S (2004) - Plant Biotechnology. A Practical Approach. Science Publishers. (2) Gemborg, O. L. and G. C. Phillips (eds). (1995) - Plant Cell, Tissue and Organ Culture. Springer Lab Manual.
2. Harrison, M. A. and Rae, I. F. (1997). "General Techniques of Animal Cell Culture". Cambridge University Press. / Masters, J. R. W. (2000). Animal Cell Culture, 3rd Edition. Oxford University Press.
3. Loyola-Vargas, Victor M, Felipe Vasquez (2005) – Plant Cell Culture Protocols. In Methods in Molecular Biology Series. Scientific and Medical Publishers.
4. S. Bhojwani and W-Y Soh (Eds) (2003) - Agrobiotechnology and Plant Tissue Culture. Science Publishers.
5. Shivramiah Shantharam and Jane F Montgomery (Eds.) (1999) - Biotechnology, Biosafety and Biodiversity: Scientific and Ethical Issues for Sustainable Development. Animal and Plant Health Inspection

Teaching and learning methods

Lectures - 2 lessons per week for 1 hour; exhibition methodologies using media. Provision of study materials via the e-learning resources. Practical classes - 1 lesson of 3 hours weekly. Practical work to implement the various laboratory techniques for cultivation of cells and tissues.

Assessment methods

- Final evaluation - (Regular, Student Worker) (Final, Supplementary)
 - Practical Work - 15%
 - Reports and Guides - 15%
 - Intermediate Written Test - 20%
 - Final Written Exam - 50%

Language of instruction

Portuguese

Electronic validation

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10-11-2019	11-11-2019	11-11-2019	11-11-2019