SHORT TEACHING GUIDES for Subjects of MUIA Máster Degree

203301001 Techniques in cellular and molecular biology (4 ECTS)

Teaching unit 1 - Analysis of metabolites by HPLC

1.1 Preparation of samples for HPLC analysis
1.2.Components and methods in HPLC operations
1.3.Application of HPLC technique
1.4.Guide for problems that can occur during HPLC operation

Teaching unit 2 - Analysis of metabolites by gas chromatography

2.1.Introduction to chromatography Definition. Basic principles. Components of a gas chromatograph, hazards and critical control points. Identification of compounds, quantification. Recent innovations
2.2.Application in the agro-alimentary field (composition, no exogenous, foreign elements). Simple gases and headspace with and without micro extraction in solid phase and/or derivatisation. Other applications: Purge and trap, electronic nose, non-destructive systems, stir bar sorptive extraction, headspace aroma fingerprinting, static and dynamic (continuous) systems. Examples in the agro-alimentary field and extraction and analysis of volatile aromas from plant tissues.

Teaching unit 3 - Analysis of proteins by mono ¿ and bi-dimensional electrophoresis

3.1. Introduction. Basic principles of electrophoresis
3.2. Electrophoretic techniques. Polyacrylamide gel electrophoresis: native, SDS and isoelectric focusing. Bi-dimensional electrophoresis. Preparation of samples. First dimension. Second dimension. Protein detection. Proteomic analysis.

Teaching unit 4 - Flow cytometry

4.1 Fundamentals of the technique
4.2 Optic and electronic of a flow cytometer
4.3 Cell sorting
4.4 Applications and practical examples.

Teaching unit 5 - The scanning electron microscope

5.1 Main concepts of the technique
5.2 Structure and functioning
5.2 Sample preparation
5.3 Applications, advantages and disadvantages

Teaching unit 6 - DNA sequence analysis

6.1 Introduction to DNA sequence analysis
6.2 Basic molecular techniques with relevance for sequencing and melting peak

analysis.
6.3 Sequencing methods ¿ Sanger; pyrosequencing; next generation sequencing.
6.4 DNA sequence analysis by melting peak analysis and high resolution melting analysis.
6.5 Applications

203301002 Genomic Tools in Research (4 ECTS)

1. Genome structure 2. DNA and chromosome structure 3. DNA structure 4. Second and third generation sequencing technology 5. Plant and animal genomes 6. Transcription and functional genomics 7. Epigenetics 8. Transcriptomic analysis 9. Genome engineering technologies

203301003 Advanced Techniques in *in-vitro* Plant Culture: Micropropagation and Production of Valuable Compounds (4 ECTS)

Unit 1: Introduction and requeriments

C1. Introduction
C2. Facilities and equipment in a micropropagation laboratory
C3. Aseptic work conditions

Unit 2: Micropropagation: methods, limitacions and aplications

C4. Micropropagation steps
C5. Multiplication methods
C6. Automation and large-scale cultures
C7. Plant micropropagation limitations
C8. Common problems associated with micropropagation
C9. Applications

Unit 3: Biosynthetic potential of plants

C10. Introduction to the study of the plant¿s biosynthetic potential
C11. In vitro culture of plant cells, tissues and organs
C12. Special productions techniques: addition of precursors, elicitation, biotransformation, mixed cultures
C13. Industrial scale cultures
C14. Applications

203301004 Plant Defense: Biotechnological Tools to obtain Plants resistant to diseases (4 ECTS)

Unit 1. INTRODUCTION

1.1. INTRODUCTION. Plant anatomy. Plant physiology.
1.2. DEFINITIONS AND CONCEPTS. Pathogen, host, elicitor, resistance, susceptibility, immunity, virulence and avirulence. Plant-pathogen

Unit 2. PATHOGENS

2.1. Types of pathogens: viruses, bacteria, fungi, nematodes, insects, parasitic plants. Mechanism of invasion.

Unit 3. PLANT DEFENCE SYSTEMS

3.1. Passive defence.
3.2. Active defence.

Unit 4. GENETICS AND MOLECULAR BASES OF PLANT-PATHOGEN INTERACTION

4.1. Monogenic-oligogenic/polygenic resistance.
4,2 General resistance and specific resistance.
4.3. Vertical and horizontal resistance. Resistance genes.

Unit 5. SYSTEMIC RESISTANCE. SIGNALLING OF THE DEFENCE

5.1. Systemic acquired resistance. Signalling.
5.2. Induced systemic resistance. Signalling.

Unit 6. INDUCTION OF RESISTANCE IN PLANTS

6.1. Biotechnological tools to induce resistance in plants. Molecular strategies. Candidate genes
for induction of resistance.
6.2. Microbial induction. Topical application of inducers.
6.3. Integration of induced resistance in crop production

203301009 Minimal processing techniques to preserve quality and safety of fruit and vegetables (4 ECTS)

1.- INTRODUCTION AND PROCESSING

T1 Introduction. Definitions. Raw material quality. Physiology and Biochemistry
T2 Minimal Processing Technologies: Unit Operations and Equipments
T3 Influence of pre-harvest factors on post-harvest quality
T4 Fresh-cut processing technologies of vegetables. Innovative developments
T5 Fresh-cut processing technologies of fruits. Innovative developments and shelf life
T6 Minimal Processing Technology in "Fifth and Sixth Range"

2.- OPTIMIZATION OF THE PRODUCTIVE PROCESS

T7 Process water sanitation. Sodium hypochlorite and alternatives
T8 Technological innovations and other sanitizers
T9 Edible coatings. Nanotechnology
T10 Design of industrial facilities for the minimum processing of fruits and vegetables. Cleaning and sanitation

3.- EMERGENT TECHNOLOGIES FOR MINIMAL PROCESSING

T11 Emerging technologies for the minimal processing of new products: smoothies, purees, hummus, etc.
T12 UV radiation as abiotic stress to increase the synthesis of bioactive compounds
T13 LED lighting technology. Energy savings, effect on quality and commercial life
T14 By-products valorization in the minimal processing industry

203301008 Risk analysis and predictive microbiology (4 ECTS)

1. Present situation of food safety in Europe: The Risk Analysis system

1.1. Situation and structure of food safety in Spain and Europe.
1.2. Components of Risk Analysis. Aplication of quantitative risk assessment
1.3. Risk ranking and its role to guarantee food safety. Examples

2. Predictive models of microbial growth and databases

2.1. The microbial growth curve
2.2. Methodology to estimate microbial growth
2.3. Modelling the microbial growth curve: primary and secundary models
2.4. Databases for predictive microbiology

3. MICROBIAL INACTIVATION KINETICS

3.1. Basic concepts in thermobacteriology
3.2. Methods to study microbial heat resistance
3.3. Deviations of logarithm kinetics of microbial inactivation
3.4. Predictive models for microbial inactivation
3.5. Non isothermal inactivation treatments and their interpretation
3.6. Microbial inactivation exposed to other lethal agents

4. CONTROL OF PATHOGENIC MICROORGANISMS PRESENT IN FOOD

4.1. Intrinsic factors of the food
4.2. Extrinsic factors of the food

5. FOOD PRESERVATION BY NON-THERMAL TECHNOLOGIES

5.1. High hydrostatic pressure
5.2. High intensity pulsed electric fields
5.3. Ionizing radiation
5.4. Other alternatives

6. INCREASED RESISTANCE MECHANISMS IN MICROORGANISMS

6.1. Main resistance mechanisms in bacteria
6.2. Technological implications of resistance mechanisms

7. APPLICATIONS OF PREDICTIVE MICROBIOLOGY TO FOOD INDUSTRY

7.1. Hurdle technology for food preservation
7.2. New emerging pathogens and their implications in food safety
7.3. New tools to guarantee food safety