

## 28957 - Post-harvest technology

### Información del Plan Docente

Academic Year	2017/18
Faculty / School	201 - Escuela Politécnica Superior
Degree	437 - Degree in Rural and Agri-Food Engineering
ECTS	6.0
Year	4
Semester	Second semester
Subject Type	Optional
Module	---

### **1.General information**

#### **1.1.Introduction**

#### **1.2.Recommendations to take this course**

#### **1.3.Context and importance of this course in the degree**

#### **1.4.Activities and key dates**

### **2.Learning goals**

#### **2.1.Learning goals**

#### **2.2.Importance of learning goals**

### **3.Aims of the course and competences**

#### **3.1.Aims of the course**

#### **3.2.Competences**

### **4.Assessment (1st and 2nd call)**

#### **4.1.Assessment tasks (description of tasks, marking system and assessment criteria)**

### **5.Methodology, learning tasks, syllabus and resources**

#### **5.1.Methodological overview**

The learning process that is designed for this subject is based on the following:

- Theoretical sessions: participatory lectures which will deepen physiology, biochemistry and microbiology of fresh plant products as well as the methods available for conservation (modified atmosphere, decontamination treatments, ...).

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- Practical sessions in laboratory where students become familiar with the parameters that determine the quality of fresh vegetable products (nutritional, physiological, maturity, physiological and microbiological changes ..)
- Seminars which will deepen the most relevant aspects of post-harvest technology by viewing video documentaries or analysis of research publications that provide a current view of the sector's problems, possible solutions and technological advances.
- Visit to a fruit and vegetable industry: the student will study the way a fruit travels from harvest to packaging and preservation. This visit will be accompanied by a talk where the company manager explained to the students all the functions that an Agri-Food and Rural engineer can perform on it. Before the visit the processes that they develop and the salient features of the establishment will be explained. This will allow students to more easily follow the explanations of technicians and allow an exchange of views with students who are in contact with industrial problems.
- Academically mentored group work: the knowledge and skills acquired in the course will be integrated with the completion of a group work in which students must design a storage system for a particular horticultural produce. The teacher will propose to each group of students a fruit or a vegetable. The student must establish maturity at harvest, the selection criteria and classification, storage temperature, the conditions of modified atmosphere packaging and the duration of conservation. Once these parameters are established they will proceed to the practical application of the chosen system. Students must then measure the quality of fruit and vegetable products during storage and determine the shelf-life based on their analysis.

All materials and resources used in teaching will be available in the Digital Teaching Ring the University of Zaragoza offers students and teachers (<http://add.unizar.es>).

### **5.2.Learning tasks**

The program that the student is offered to achieve the expected results includes the following activities ..

- 30 hours of lectures (participative master classes)
- 10 hours of laboratory practices organized in 5 sessions of 2 hours.
- 10 hours of seminars organized in 5 sessions of 2 hours.
- 5 hours spent on the visit to a fruit and vegetable industry
- 5 hours for preparation, implementation and presentation of a mentored group work (5 sessions of 1 hour)

Academic tutoring: students will have the support and advice of the teacher in schedule that will present well in advance

### **5.3.Syllabus**

#### **Theory Programme**

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### TEACHING UNIT 1. INTRODUCTION

Topic 1. Introduction to post-harvest physiology and preservation (0.1 ECTS).

Topic 2. Economic and nutritional importance of fresh food of a plant origin on a global scale, European scale and Spanish scale (0.1 ECTS).

Teaching-learning activities:

Interactive master's class: 0.2 ECTS

### TEACHING UNIT 2. STRUCTURE, PHYSICAL-CHEMICAL CHARACTERISTICS AND POST-HARVEST ALTERATIONS TO FRUIT AND VEGETABLE PRODUCTS

Topic 3. Structure, chemical composition and nutritional value of fruit and vegetables (0.3 ECTS).

Topic 4. Physiological and physical-chemical changes during the ripening and senescence of fruit and vegetables (0.4 ECTS).

Topic 5. Fruit and vegetable quality (0.3 ECTS).

Topic 6. Post-harvest alterations to fruit and vegetables (0.2 ECTS)

Teaching-learning activities:

Interactive master's class: 1.2 ECTS

### TEACHING UNIT 3. POST-HARVEST PRESERVATION TECHNOLOGIES

Topic 7. Operations prior to the post-harvest preservation of fruit and vegetables (0.2 ECTS)

Topic 8. Pre-refrigeration and refrigerated conservation (0.3 ECTS)

Topic 9. Modified and controlled atmospheres and the preservation of fresh fruit and vegetables (0.4 ECTS)

Topic 10. Handling ethylene in post-harvest preservation (0.2 ECTS)

Topic 11. Emergent post-harvest technologies for fruit and vegetables (0.4 ECTS)

Topic 12. Waste management in the fruit and vegetable industry (0.1 ECTS)

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Teaching-learning activities:

Interactive master's class: 1.4 ECTS

### Practical Programme

#### TEACHING UNIT 2. STRUCTURE, PHYSICAL-CHEMICAL CHARACTERISTICS AND POST-HARVEST ALTERATIONS TO FRUIT AND VEGETABLE PRODUCTS

Practical 1. Measuring vitamin C in fruit and vegetables: The influence of the degree of ripeness (0.2 ECTS)

Practical 2. Measuring carotenoids in fruit and vegetables: The influence of the degree of ripeness (0.2 ECTS)

Practical 3. Measuring the respiration rate of certain fruit and vegetables: The influence of species and temperature (0.2 ECTS)

Practical 4. Measuring the degree of ripeness in fruit and vegetables (0.2 ECTS)

Practical 5. Identifying tropical fruit species. Cold damage and storage conditions (0.2 ECTS)

Seminar 1. Identifying physiological changes (0.2 ECTS)

Seminar 2. Identifying pathological changes (0.2 ECTS)

Teaching-learning activities:

Laboratory practicals: 1 ECTS

Seminars: 0.4 ECTS

#### TEACHING UNIT 3. POST-HARVEST PRESERVATION TECHNIQUES

Seminar 3. Preliminary operations in a fruit and vegetable centre (0.2 ECTS)

Seminar 4. Preservation methods for fruit and vegetables (0.2 ECTS)

Seminar 5. New methods of control for microbial changes (0.2 ECTS)

Visit to a fruit and vegetable centre (0.5 ECTS)

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Teaching-learning activities:

Seminars: 0.6 ECTS

Visits: 0.5 ECTS

For the whole course:

Supervised project: 0.5 ECTS

### 5.4.Course planning and calendar

Week	Theory sessions	Laboratory sessions	Seminars	Visits	Mentored work	Exams/ Reports
1	U 1 (2 h)					
2	U 2 (2 h)	LP1 (2 h)				
3	U 2 (2 h)	LP2 (2 h)				Report LP1
4	U 2 (2 h)	LP3 (2 h)				Report LP2
5	U 2 (2 h)	LP 4 (2h)				Report LP3
6	U 2 (2 h)	LP5 (2 h)				Report LP4
7	U 2 (2 h)		S1 (2 h)		MW 1 (1 h)	Report LP5  Exam units 1 and 2

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<b>8</b>						
<b>9</b>						
<b>10</b>	U 3 (2 h)		S2 (2 h)			Report S1
<b>11</b>	U 3 (2 h)		S3 (2 h)			Report S2
<b>12</b>	U 3 (2 h)				MW 2 (1 h)	Report S3
<b>13</b>	U 3 (2 h)				MW 3 (1 h)	
<b>14</b>	U 3 (2 h)		S4 (2 h)			
<b>15</b>	U 3 (2 h)		S5 (2 h)		MW 4 (1 h)	Report S4
<b>16</b>	U 3 (2 h)			Visit 1	MW 5 (1 h)	Report S5  Mentored work presentation
<b>17</b>	U 3 (2 h)					Exam unit 3  Report V1

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U: unit

LP: laboratory sessions

S: seminars

MW: mentored work

V: visit

### 5.5. Bibliography and recommended resources

**BB**

Fisiología y manipulación de frutas y hortalizas post-recolección / R.H.H. Wills ... [et al.] ; traducido del inglés por Justino

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- Burgos González . Zaragoza : Acribia, D.L.1984
- BB** Postharvest technology of horticultural crops / Adel A. Kader, technical editor . 3rd ed. Oakland, California : University of California, 2002
- BC** Bases biológicas de la calidad de la fruta / editor Michael Knee ; traducción a cargo de : Rosa Oria Almudí, Mercedes Jaime Sisó . Zaragoza : Acribia, 2008
- BC** Durán Torrallardona, Sebastián. Frigoconservación de la fruta / Sebastián Durán Torrellardona . Barcelona: Aedos, 1983
- BC** Holdsworth, S. D.. Conservación de frutas y hortalizas / S. D. Holdsworth . [1ª ed.] Zaragoza : Acribia, 1988
- BC** Jongen, W. (2005). Improving the safety of fresh fruit and vegetables. London: CRC Press
- BC** Nascimento, M.C. (2008). Color atlas of postharvest quality of fruits and vegetables. Blackwell Publishing
- BC** Southgate, David. Conservación de frutas y hortalizas / David Southgate ; traducido por Pedro Ducar Maluenda . 3a.ed. Zaragoza : Acribia, D.L.1992
- BC** Thompson, A. K.. Almacenamiento en atmósferas controladas de frutas y hortalizas / A. K. Thompson ; traducción de Alberto Ibarz Ribas, Jordi Pagán Gilabert . Zaragoza : Acribia, D.L. 2003
- BC** Yahia, E.M.(2009). Modified and controlled atmospheres for the storage, transportation, and packaging of horticultural commodities. London: CRC Press

### LISTADO DE URLs:

- Blankenship, S. (2001). Ethylene effects and the benefits on 1-MCP. Perishables Handling Quaterly, 108, 1-4  
[<http://ucanr.edu/datastoreFiles/234-94.pdf>]
- Kader, A.A., Zagory, D., Kerbel, E.L (1989). Modified atmosphere packaging of fruits and vegetables. Critical Reviews in Food Science and Nutrition 28(1), 1-30  
[<http://ucanr.edu/datastoreFiles/234-525.pdf>]
- Lurie, S., Crisosto, C. (2005). Chilling injury in peach and nectarine. Postharvest Biology and Technology, 37, 195-208  
[[https://www.clemson.edu/extension/peach/files\\_documents/chillinginjurypeach.pdf](https://www.clemson.edu/extension/peach/files_documents/chillinginjurypeach.pdf)]
- Zagory, D., Kader, A.A. (1988) Modified atmosphere packaging of fresh produce. Food Technology, 42(9), 70-74,76-77  
[<http://ucce.ucdavis.edu/files/datastore/234-400.pdf>]



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The updated recommended bibliography can be consulted in:  
<http://psfunizar7.unizar.es/br13/egAsignaturas.php?id=8118>