Universitat de Lleida

DEGREE CURRICULUM

INDUSTRIES OF FRESH HORTICULTURAL PRODUCTS

Coordination: GRAELL SARLE, JORGE MARIANO

Academic year 2019-20

Subject's general information

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<tr><td>Subject name</td><td>INDUSTRIES OF FRESH HORTICULTURAL PRODUCTS</td></tr>
<tr><td>Code</td><td>102258</td></tr>
<tr><td>Semester</td><td>1st Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
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<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Food Science and Technology</td><td>3</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
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<tr><th>Activity type</th><th>PRALAB</th><th>PRAULA</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>0.9</td><td>1.3</td><td>3.8</td></tr>
<tr><td>Number of groups</td><td>1</td><td>1</td><td>1</td></tr>
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<tr><td>Coordination</td><td>GRAELL SARLE, JORGE MARIANO</td></tr>
<tr><td>Department</td><td>FOOD TECHNOLOGY</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>60 hours + 90 hours</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan or Spanish</td></tr>
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Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
GRAELL SARLE, JORGE MARIANO	jordi.graell@udl.cat	6	

Subject's extra information

It is a subject that has the character of optional, so that the students can choose it in the last courses of the degree, and thus to deepen in the study of the processes of conditioning and conservation in fresh to which they are submitted the fruits and the vegetables harvested, which are carried out in fresh product industry and in the minimally processed products industry.

Learning objectives

The student, upon passing the subject, must be able to:

- Specify the maturity and quality requirements to be met by horticultural raw materials to be used in cold storage processes.

- Select and plan the necessary steps to carry out a specific post-harvest management process of a particular fresh fruit and vegetable product.

- Describe the action of the different technical parameters of an operation or treatment on the modifications of the characteristics of the horticultural products.

- Select the equipment needed to be applied in each of the stages of a post-harvest processing process of a horticultural product.

- To choose the optimal conditions for the storage and refrigerated transport for a certain horticultural product. - Recognize, according to symptoms, the types of alterations that can develop in fruits and vegetables throughout their post-harvest life, especially to be submitted to conservation in cold storage, and to estimate the possible causes.

- Evaluate the necessary capacity of the equipment to be used in the conditioning and in the cold storage of fruit and vegetable products.

- Specify the quality characteristics that, according to the corresponding regulations, have to present the different types and commercial categories of fruits and vegetables.

- To interpret the analytical values ??referring to the composition and the characteristics of the horticultural products throughout its process of cold storage, to proceed to the regulation of the same.

- Graphically outline the sections or areas that are part of a horticultural industry, to make a preliminary design of the layout in the plant.

- Select the most appropriate production procedures and technologies for different minimally processed products (IV game), from post-harvest handling to commercialization.

- To identify the factors of sanitary, organoleptic and nutritious quality of fruits and vegetables that represent a critical element in the processes of transformation in minimally processed products, as well as the forms of evaluation and control to be applied.

- Establish the control elements of the production and the quality in companies dedicated to the production and commercialization of minimally processed products, placing them in the normative framework.

Competences

General competences

CG2: That students know how to apply their knowledge to their work or vocation in a professional way and have the skills that are usually demonstrated through the elaboration and defense of arguments and problem solving in their area of ??study.

CG4: That the students can transmit information, ideas, problems and solutions to a public as specialized as non-specialized.

CG6: Analyze concrete situations, define problems, make decisions and implement action plans in the search for solutions.

CG7: Interpret studies, reports, data and analyze them numerically.

CG8: Select and use the available written and computerized information sources related to the professional activity.

CG9: To use existentrs computer and communication tools as support for the development of their professional activity (strategic competence UdL)

CG10: Working alone and in a multidisciplinary team.

CG11: Understand and express yourself in the appropriate terminology.

CG12: Present oral and written information (strategic competency UdL)

CG18: Have a critical and innovative spirit.

CG19: Analyze and evaluate the environmental implications in the professional activity.

Specific competences: Food Technology

CE22: Know the food processing equipment and know how to use them.

CE23: Outline, based on flow diagrams, the processes of food processing and preservation.

CE24: Identify and evaluate raw materials, ingredients, additives and technological adjuvants for use in the agri-food industry.

CE27: Interpret the physical and chemical changes that occur during the different processes of food processing.

CE28: To modify the processes of elaboration of a food based on some objectives.

CE29: Select equipment and organize food processing and packaging lines.

CE30: Develop new processes and products.

CE31: Identify and evaluate the various parts of an agri-food industry project.

CE32: Sizing production lines.

CE33: Estimate the capacities of equipment for the production lines and the needs of auxiliary systems.

Subject contents

PART A: HORTICULTURAL FRESH PRODUCTS (FRUIT AND VEGETABLES)

Theory

Unit 1.- Introduction.

Economic data of the sector hortofrutícola.- Concept of hortiucltural industry.- Main fresh products treated in the horticultural industries.- Process diagrams.- Necessity of the conditioning and the cold preservation of fruits and vegetables in fresh.- Fundamentals of the treatment of fresh horticultural products.- Evolution of recent techniques and innovations in the horticultural industries.

Unit 2.- The quality in fruits and vegetables in fresh.

Concept of quality.- Commercial quality, organoleptic and dietetic in fruits and vegetables.- Normatives.- Attributes of quality.- Evaluation of the quality of fruits and vegetables: physical, chemical and sensorial determinations.- Quality management systems.- Environmental management systems.

Unit 3.- Operations prior to the arrival of the products to the industry.
Preparation of cold rooms and other sections.- Revision of technical installations.- Disinfection and cleaning of cold stores.- Preparation of containers and other maintenance elements.- Pre-harvest planning and follow-up in the field.- Harvest. Last date of harvest. - Transport of the products to the industry.- Reception of the productes to the industry.- Traceability.

Unit 4 - Treatments prior to the conservation and / or expedition of the products.
Purpose of the treatments: examples of application to various products.- Methods used for treatments- Chemical treatments: types of active substances.- Equipment for chemical treatments. Conditions of use - Problematics of chemical treatments - Thermic treatments .- Gaseous treatment .- Treatments with radiation.

Unit 5.- Cooling of products.
Precooling: purpose and beneficial effects.- Speed ??of semi-cooling of a product: factors.- Systems and equipment of pre-cooling.- System of pre-cooling by air.- System of pre-cooling by water.- System of pre-cooling by vacuum.- System of Pre-cooling by ice. - Criteria for the selection of a system. - Conditions of application of the pre-cooling to different horticultural products.

Unit 6.- Storage technology in normal refrigeration.
Objectives of refrigeration storage.- Parameters of cold storagel.- The storage temperature: optimum values, control and regulation.- Cooling regimes.- Relative humidity: values, control and regulation.- Air movement: recirculation and renovation.- Charge operation of the cold room: product storage.- Product monitoring in the chamber.- Discharge operation of cold chamber.

Unit 7.- Controlled atmosphere storage technology. (I). Concepts and fundamentals
Concept of controlled atmosphere: differences with modified atmospheres.- Fundamentals of controlled atmosphere.- Benefits and limitations of storage in controlled atmosphere.- Types of controlled atmospheres.- Recommended conditions: balance of parameters.- New techniques of controlled atmosphere: very Low levels of oxygen, low level of ethylene, dynamic controlled atmosphere.- Management of the product and the chambers in a controlled atmosphere.- Safety standards.

Unit 8.- Controlled atmosphere storage technology. (II). Equipment and facilities
Characteristics and elements of controlled atmosphere chambers. - Hermiticity to gases in the chambers: hermiticity test. - Pressure equilibrium: compensatory lungs and valves. - Generation and maintenance of controlled atmospheres: phases and systems. - O2 reducing equipment : Burners, air separators (PSA and membranes), sweeping with nitrogen.- CO2 reducing equipment: active carbon adsorber.- Equipment for gas analysis in chambers.- Automatic and regulation of controlled atmosphere.

Unit 9.- Special techniques: accelerated maturation, degreening.

Accelerated maturation: concept and purpose.- Parameters in accelerated maturation chambers.- Accelerated

maturation chamber installations.- Conditions for application to different products.- Degreening: concept and purpose.- Parameters in degreening chambers- Installations in degreening chambers - Conditions of application to different products.

Unit 10.- Conditioning and preparation operations for the fruit and vegetable market.

Purpose of the conditioning - Schemes of typical lines of conditioning of horticultural products. - Feeding equipment of the lines. - Equipment for the cleaning and washing of the products. - Equipment for the drying. - Equipment for the application of waxes and other coatings. - Equipment for the selection of products. - Equipment for the classification of products: mechanical, electronic. - Operation of packaging and palletizing. - Operation of weighing and labeling.

Unit 11.- Transport and distribution of horticultural products.

Expedition of products: expedition chambers and loading docks.- Conditions for the transport of vegetable products in fresh.- Transport systems.- Land transport: road and rail.- Maritime transport.- Air transport.- Mixed loads: compatibility between products.- Distribution of horticultural products.- Exhibition of products at the points of sale.- Recommendations and care of the fruit in the home.

Unit 12.- Post-harvest losses of horticultural products.

Types and importance of post-harvest losses of horticultural products.- Losses caused by mechanical damages: types of damages.- Losses due to microbial alterations. Causes and types.- Losses due to physiological alterations. Causes and types.- Losses due to dehydration in fruits and vegetables.

Unit 13.- Horticultural industry. Technical characteristics.

Horticultural industries: function.- Types of horticultural plants.- Diagrams of process: main operations.- Sections of a horticultural industry.- Basic installations in a horticultural industry.- Aspects of the design of horticultural plants.- Legislative aspects on design and operation of horticultural plants.

Unit 14.- Cold rooms: technical characteristics

Design of the cold room: dimensions and constructive aspects. - Installation of insulation: purpose, insulation materials and anti-vapor materials. - Insulation mounting systems: traditional and integral. - Refrigeration system by mechanical compression: elements and operating principles. - Refrigerants: types, characteristics and application. - Characteristics of refrigeration equipment: compressors, condensers and cooling towers, evaporators. - Main automatism of control and regulation of the refrigeration system.

PART B: INDUSTRIES FOR THE PROCESSING OF MINIMALLY PROCESSED PRODUCTS (IV GAMME)

Unit 15.- Introduction to the minimum processing of vegetal products.

Data of the sector of fruits and vegetables of IV gamma.- Main products elaborated.- Definitions.- Conditions of the raw materials.- Fundamentals of the minimum processing of vegetal products.

Unit 16.- Processing technology of cut fruits and vegetables.

Handling in pre- and post-harvest.- Conditioning of raw materials.- Sanitation systems.- Use of additives to limit browning and other quality losses.- Dosing and packaging systems- Equipment for the inspection of production- Requirements of the facilities And regulatory framework.

Unit 17. Conservation and distribution of cut fruits and vegetables.

Packaging of the products cut in modified atmosphere.- Importance of the chain of cold.- Implications on the physiology of cut vegetable products.- Applicable legal regulation.- Evaluation of the useful life.- Recommendations for the transportation, sale and consumption of Minimally processed products.

Unit 18.- Management and evaluation of quality in minimally processed fruit and vegetable industries.

Quality management and assurance in minimally processed product industries - Attributes of microbiological, organoleptic and nutritional quality.- Main alterations- Methods of quality evaluation.- Quality standards and applicable legislation.

Practical activities

Exercises:

1. Interpretation of technical information on equipment from catalogs.

2. Interpretation of information in scientific and technical articles.

3. Calculations exercices about design of cold rooms..

4. Calculation exercises of equipment and installations.

Lab practices:

1. Identification of alterations in fruits and vegetables.

2. Analysis of quality parameters and maturity in fruits and vegetables.

3. Sensory analysis of fruits.

4. Preparation of a minimally processed product and evaluation of the quality during its conservation.

Visit to an industry:

Visualization of process, equipment and facilities in an industry.

Elaboration of work:

Bibliographic work on postharvest management technology of a specific product.

Evaluation

Activity	**Process**	**Number**	**% qualification**
Master lesson	2 written tests	2	**70 (35+35)**
Exercises	Resolution of exercices		**10**
Classroom activity, Laboratory and visit	Delivery of reports		**10**
Work	Delivery and exposition		**10**
Total			**100**

In order to pass the subject, it is necessary:

- to obtain an average grade between the two written tests of 5 or more (without neither of them having a mark lower than 4.5).

- to make and deliver the reports of laboratory practices, visits to industries and exercises

- to obtain a grade greater than or equal to 5, considering all activities with your measurable weight .

(no previous course grades are saved)

Bibliography

Basic bibliography

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