



DEGREE CURRICULUM

FOOD FERMENTATIONS

Coordination: MARIN SILLUE, SONIA

Academic year 2023-24

FOOD FERMENTATIONS 2023-24

Subject's general information

| | | | | |
|--|---|--------|------------|------------------|
| Subject name | FOOD FERMENTATIONS | | | |
| Code | 101623 | | | |
| Semester | 2nd Q(SEMESTER) CONTINUED EVALUATION | | | |
| Typology | Degree | Course | Character | Modality |
| | Bachelor's Degree in Biotechnology | 3 | COMPULSORY | Attendance-based |
| Course number of credits (ECTS) | 6 | | | |
| Type of activity, credits, and groups | Activity type | PRALAB | | TEORIA |
| | Number of credits | 0.7 | 1.4 | 3.9 |
| | Number of groups | 4 | 2 | 1 |
| Coordination | MARIN SILLUE, SONIA | | | |
| Department | FOOD TECHNOLOGY, ENGINEERING AND SCIENCE | | | |
| Teaching load distribution between lectures and independent student work | on-site: 60 h off-site: 90 h | | | |
| Important information on data processing | Consult this link for more information. | | | |
| Language | Catalan 50% Spanish 50% | | | |

| Teaching staff | E-mail addresses | Credits taught by teacher | Office and hour of attention |
|---------------------|---------------------|---------------------------|------------------------------|
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| MARIN SILLUE, SONIA | sonia.marin@udl.cat | 7,4 | |

Subject's extra information

Food Fermentation is a compulsory subject in the degree that deals with the basics of microbiology and processes for major fermented foods such as wine, beer, bread, yogurt, cheese, cured meat products and fermented vegetable products. These processes are based on basic subjects such as chemical engineering, microbiology, biochemistry and bioreactors.

Learning objectives

Students who pass the course must:

Know the technological and microbiological aspects of the development of major fermented foods such as wine, beer, bread and the like yogurt and fermented milk, cheese, cured meat products and fermented vegetables, with special emphasis on microbial starter cultures used.

Students who pass the course should be able to:

- Correctly apply the theoretical knowledge in solving any problems that may arise in the food industry.
- Correctly apply the theoretical knowledge in the design and process development of fermented food products.

Competences

Basic skills

CB1 Students have to demonstrate to possess and understand knowledge in an area of study that starts from the basis of general secondary education, and is usually at a level that, although it is supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study.

CB2 The students have to know how to apply their knowledge to their work or vocation in a professional manner and possess the competencies and the skills that are usually demonstrated through the development and defense of arguments and problem solving within their field of study.

CB3 That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical issues.

CB4 The students have to be able to transmit information, ideas, problems and solutions to both specialized and non-specialized audiences.

CB5 The students have to developed those learning skills necessary to undertake further studies with a high degree of proficiency undertaking further studies with a high degree of autonomy.

General skills

GC1 Being able to selectively search for and use sources of information necessary to achieve the training objectives.

GC2 Interpret scientific-technical information with a critical sense, and be able to make presentations based on this information.

GC3 Working in a team, with a multidisciplinary vision and with the ability to make a rational and efficient distribution of tasks among team members.

GC4 Knowing and adequately using the scientific and technical vocabulary of the different areas of Biotechnology.

GC5 Working in the laboratory applying criteria of quality and good practice.

Transversal skills

CT1 Being able to produce comprehensible written and oral reports on the work carried out, with a justification based on the theoretical-practical knowledge obtained.

CT3 To use information and communication tools and techniques for data analysis and the preparation of oral and written reports and other training and professional activities.

Specific skills

CE30 To know the technological processes based on the use of living beings and their optimization strategies.

CE32 To know the use of animal, plant and microbial cells in biotechnological processes.

CE34 Be able to design the protocol of a specific biotechnological process with the necessary practical requirements to carry it out and its evaluation parameters.

CE44 To know the main fields of application of biotechnology and acquire basic training in some of them.

Subject contents

Unit 1 .- Production methods in Industrial Microbiology. Use of microorganisms for industrial purposes. Stages of industrial fermentation. Biological stage. Non biological stages- downstream. Application of biotechnology in industrial fermentations.

Unit 2 .- Starter cultures. Objectives. Microorganisms used as starter cultures. Taxonomy. Technology of starter cultures: Liquid cultures, dried cultures (lyophilized and dried), frozen ccultures. Concentrated and non-concentrated starters. Preservation methods. Inhibiting agents.

Unit 3 .- Wine. Technology of wine. Alcoholic fermentation. Stages of fermentation of wine. Succession of yeast species. Use of selected yeasts. Criteria. Terms development of yeasts. Maloalcoholic fermentation. Malolactic fermentation. Malolactic bacteria. Factors influencing the process. Special wines: microbiology.

Unit 4 .- Beer. Technology of beer. Characterization of a brewing yeast. Quality criteria for the selection of yeast. Microbiological aspects of brewing. Manufacturing technology. Fermentation techniques: ale and lager. Recovery and reuse of yeast.

Unit 5 .- Bread. Microbiota of sourdough. Yeasts and bacteria. Metabolism of yeast in bread dough. Manufacturing technology. Fermentation in making bread.

Unit 6 .- Yogurt. Microbiology. Microbiology of fermentation. Theory of symbiosis and stimulating factors. Biochemical aspects: Metabolism of carbohydrates, proteins, lipids and vitamins. Manufacturing technology. Influence on microorganisms. Production and maintenance of starter cultures. Fermented milk.

Unit 7 .- Cheese. The lactic ferments in cheese. Characteristics and classification of lactic ferments. Factors affecting the optimal activity of lactic starters. Metabolism of carbohydrates, proteins, lipids and citrate. Manufacturing technology.

Unit 8 .- Cured meat products. Manufacturing technology. The curing process and its microbiology. Nitrosation and salting of meat. Biochemical changes. Microbiota involved. Molecules present in the sausage likely to contribute to the flavor and aroma.

Unit 9 .- Fermented vegetable products. Common features of these processes. Manufacturing technology. Microorganisms involved. Physicochemical factors that control the rate and extent of microbial growth. Microbiological aspects of fermented products.

Practical activities

Practice 1 .- Technological and microbiological aspects of yogurt. Influence of fermentation temperature, concentration of starter culture and quality of the raw material in the production of yogurt. Knowledge of other fermented milk products.

Practice 2 .- Wine Microbiology. Evolution of the microbiota during fermentation. Identification of wine yeasts.

Practice 3. - Production of a starter culture. Optimization of parameters of bioreactors.

Methodology

| Training activity | On-site/off site | | Off-site | | Assesment | Total time | |
|----------------------------|---------------------------|-------|------------------|-------|-----------|------------|------|
| | Objective | Hours | Student work | Hours | Hours | Hours | ECTS |
| Lecture | Description of the basics | 30 | Study time | 44 | 4 | 78 | 3.12 |
| Interactive lecture | Solving practical cases | 5 | Problem solving | 2 | | 7 | 0.28 |
| Laboratory | Practical work | 20 | Issuing a report | 14 | | 34 | 1.36 |
| Guided work | | 1 | Producing report | 30 | | 31 | 1.24 |
| Total | | 56 | | 90 | 4 | 150 | 6.0 |

PERSONAL PROTECTIVE EQUIPMENT (PPE) for the practical sessions

It is **MANDATORY** that students have the following personal protective equipment (PPE) in the course of teaching practices.

- Laboratory coat UdL unisex
- Safety glasses
- Chemical / Biological protection gloves

The PPE can be purchased at UdL's ÚDELS store

Center for Cultures and Cross-Border Cooperation - Capponet Campus

Carrer de Jaume II, 67 low

25001 Lleida

<http://www.publicacions.udl.cat/>

For more information, check the product listings: <http://www.biotechnologia.udl.cat/en/pla-formatiu/equipament.html>

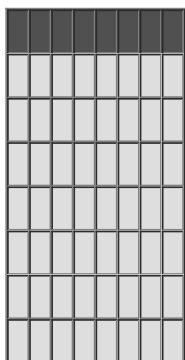
For other protection equipment (for example, caps, respiratory masks, etc.), they will depend on the type of practice to be performed. In this case, the responsible professor will inform if the use of these specific PPE is necessary.

Not carrying the PPE described or not complying with the general security regulations detailed below will mean that the student can not access the laboratories or have to leave the same.

GENERAL SAFETY RULES IN LABORATORY PRACTICES

- Maintain the place of performance of clean and tidy practices. The work table must be free of backpacks, folders, coats ...

- In the laboratory you can not come with shorts or short skirts.
- Bring closed and covered shoes during the performance of the practices.
- Bring long hair always collected
- Keep the cords fit to protect against spills and spills of chemical substances.
- Do not carry wide bracelets, pendants or sleeves that can be trapped by the equipment, assemblies ...
- Avoid wearing contact lenses, since the effect of chemicals is much greater if they are introduced between the contact lens and the cornea.
- Do not eat or drink in the laboratory
- Smoking is prohibited within laboratories
- Wash your hands whenever you have contact with a chemical and before leaving the laboratory.
- Follow the teacher's instructions and consult any questions about security



Development plan

<https://unidisc.csuc.cat/index.php/s/3cEm5cPsknp67g4?path=%2FPROVISIONALS%20SEM%202%20CURS%2023-24#>

Evaluation

| Written tests | Practical courses | Other activities |
|---------------|-------------------|------------------|
| 60% | 15% | 25% |

| Type of activity | Assessment type | | Weight |
|-----------------------------------|----------------------|---------|------------|
| | Procedure | Number | (%) |
| Theory SECTION 1 | Written test | 1 | 30 |
| Theory SECTION 2 | Written test | 1 | 30 |
| Laboratory SECTION 3 | Report | 1 | 15 |
| Other activities SECTION 4 | Team report | 1 | 15 |
| | Classroom activities | several | 10 |
| Total | | | 100 |

A grade of more than 4 will be required in the written tests and an average of 5 between the two tests to be eligible for the average with the other activities. Written recovery tests will be passed with a 5.

Alternative assessment: SECTION 1 and 4 (50% written test), SECTION 2 and 3 (50% written test). Minimum mark in the two tests = 5. The dates coincide with those of the continuous evaluation (see Development Plan).

Bibliography

Bibliography

Bamforth, Charles W. 2007. Alimentos, fermentacion y microorganismos. Zaragoza. Acribia. Fermentation microbiology and biotechnology. 2006. El-Mansi [et al.] 2nd ed. London. Taylor & Francis cop.

Bamforth, Charles W. 2005. Food, fermentation and micro-organisms. Oxford Blackwell cop. Food fermentation. 2005. Rob M.J. Nout, Willem M. De Vos, Marcel H. Zwietering. Wageningen Academic Publishers.

Handbook of food and beverage fermentation technology. 2004. Y.H. Hui [et al.]. New York Basel Marcel Dekker cop.

Microbiology of fermented foods. 1998. Brian J.B. Wood. 2nd ed. London. Blackie Academic & Professional cop.

Suárez Lepe, José Antonio. 1997. Levaduras vínicas funcionalidad y uso en bodega. Bilbao. Mundi-Prensa cop.

Boulton, Chris. 2001. Brewing yeast and fermentation. Blackwell Science.

Digital bibliography

La biblioteca de l' ETSEA té subscrita la versió digital de nombroses revistes de l'àmbit de la Biotecnologia. Es recomana la consulta, en particular, de las següents revistes en relació amb l'assignatura:

- Food Biotechnology
- International Journal of Food Microbiology
- International Journal of Food Science and Technology
- Journal of Industrial Microbiology and Biotechnology
- Trends in Food Science and Technology