Universitat de Lleida

DEGREE CURRICULUM

FOOD FERMENTATIONS

Coordination: SANCHIS ALMENAR, VICENTE

Academic year 2021-22

Subject's general information

Subject name	FOOD FERMENTATIONS
Code	102257
Semester	1st Q(SEMESTER) CONTINUED EVALUATION
Typology	

Degree	Course	Character	Modality
Bachelor's Degree in Food Science and Technology	3	OPTIONAL	Attendance-based

Course number of credits (ECTS)	6
Type of activity, credits, and groups	

Activity type	PRALAB	PRAULA	TEORIA
Number of credits	2	1	3
Number of groups	1	1	1

Coordination	SANCHIS ALMENAR, VICENTE
Department	FOOD TECHNOLOGY
Important information on data processing	Consult this link for more information.

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
SANCHIS ALMENAR, VICENTE	vicente.sanchis@udl.cat	6	

Subject's extra information

Food fermentations is an elective subject of the studies in Food Science and Technology that allows to know the basic aspects of microbiology and production processes of the main fermented foods such as wine, beer, bread , yogurt, cheese, cured meat products, fermented vegetable products, and vinegar. This knowledge complements basic subjects such as microbiology, chemistry and food industries.

Learning objectives

This subject is not taught in English. Please, check the available information in Catalan or Spanish. In case you need information in English, please contact the teaching staff of the subject.

Upon passing the course, the student must be able to:

- Know the technological and microbiological aspects of the production of the main fermented foods such as wine, beer, bread, yogurt, cheese, cured meat products, fermented vegetables and vinegar, with special emphasis on the microbial starter cultures used in these fermentations, and bacteriocins.

- Correctly apply theoretical knowledge in solving possible problems that may arise in the agri-food industry.-

- Express orally and with the ability to synthesize the most important aspects of agri-food fermentations

Competences

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Subject contents

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Topic 1. Production methods in Industrial Microbiology. Use of microorganisms for industrial purposes. Phases of industrial fermentation. Biological stage. Non-biological stage- Separation and purification of products. Application of biotechnology to industrial fermentations.

Topic 2. Starters. Objectives in your employment. Microorganisms used as starter cultures. Taxonomic aspects. Starter culture technology: liquid cultures, dehydrated cultures (desiccated and lyophilized), frozen cultures and concentrated cultures. Conservation methods. Inhibitory agents.

Topic 3. Wine. Wine technology. Alcoholic fermentation. Useful yeasts in vinification. Stages of wine fermentation. Succession of yeast species. Use of selected yeasts. Selection criteria. Yeast growth conditions. Biological deacidification of wine. Maloalcoholic fermentation. Malolactic fermentation. Malolactic bacteria. Factors that influence the process. Implementation and use of malolactic cultures. Microbial alterations. Special vinifications from the microbiological point of view. Noble rot white wines. The aging of generous wines. Sparkling wines. Biotechnological applications in winemaking.

Topic 4. Beer. Beer technology. Typification of a brewer's yeast. Quality criteria in the selection of yeasts. Pure culture propagation. Evaluation of the yeasts produced. Microbiological aspects of brewing. Malted. Must production, must cooking and hopping, cooling and filtration. Fermentation techniques: ale and lager. Yeast recovery and reuse. Final processes- Maturation of the flavor. Hygienic aspects of beer.

Topic 5. Bread. Microbiota of fermented doughs. Yeasts and bacteria. Metabolism of baker's yeast in bread dough. Manufacturing technology Fermentation in the manufacture of bread. Production of baker's yeast. Sourdough. Biotechnological applications in bread making.

Topic 6. Yogurt. Microbiology. Microbiology of the starters. Theory of symbiosis and stimulating factors. Biochemical aspects: Metabolism of carbohydrates, proteins, lipids and vitamins. Manufacturing technology. Influence on microorganisms. Homogenization. Pasteurization and Concentration. Production and conservation of starter cultures. Quality control in manufacturing. Other fermented milks.

Topic 7. Cheese. Lactic ferments in cheese. Characteristics and classification of lactic ferments (BAL). Factors that affect the optimum activity in lactic starters: Streptococcus, Leuconostoc, Lactobacillus, propionibacteria. Functions of the starters. Metabolism of carbohydrates, proteins, lipids and citrate. Manufacturing technology. Milk selection: bacteriological quality. Homogenization. Pasteurization. Coagulation. Maturation. Factors influencing maturation. Production and conservation of starter cultures. Hygienic aspects in the elaboration of cheeses.

Topic 8. Cured meat products. Sausages and salted meats. Manufacturing technology. The curing process and its microbiology. Salting and nitrosation of meats. Biochemical changes. Halotolerant microbiota, c) lactic acid microbiota, d) mycobiota. Origin of the molecules present in the sausage likely to contribute to an acid taste- Nature of the microorganisms present in the salami. Degradations leading to the obtaining of the molecules responsible for the acid taste. Microbiota causing infections and intoxications.

Topic 9. Fermented vegetable products or pickles. Common characteristics of the processes. Facilities. Manufacturing technology. Previous treatments. Salty. Fermentation. Microorganisms. Phases. Physical-chemical factors that control the rate and extent of microbial growth. Pasteurization. Alterations. Microbiological aspects of fermented products. Sauerkraut, fermented pickles and olives. Alterations.

Topic 10. Bacteriocins. Structural features. Production genetics. Antimicrobial spectrum. Primary and secondary mechanism of action. Sensitivity of bacteriocins to heat, acidity and enzymes. Genetic and biochemical characteristics of bacteriocins associated with lactic acid bacteria. Applications of bacteriocins and/or bacteriocin-producing microorganisms in food.

Topic 11. Probiotics and Prebiotics for a healthy diet. Gut microbiota. Functional foods that are on the market. Probiotics. Definition and characteristics. Main probiotics. Effects on the health of consumers. Guidelines for the development of a probiotic. Prebiotic. Definition and characteristics. Effects on the health of consumers. Main prebiotics.

Topic 12. Vinegar. Chemical composition and applications. Acetic fermentation. Biochemical activity of bacteria. Acetic bacteria. Factors that affect the development of acetic acid bacteria. Methods of elaboration of vinegars. Manufacturing anomalies.

Practical activities

Practice 1. Microbiology of wine. Evolution of the yeast microbiota during must fermentation. Identification of wine yeasts.

Practice 2. Microbiology of beer. Total count of microorganisms in a starter or starter culture. Brewer's yeast viability test. Characterization of a brewer's yeast. Determination of contaminants in a starter culture.

Practice 3. Technological and microbiological aspects of yogurt. Influence of fermentation temperature, amount of starter culture and quality of the raw material in the production of yogurt. Knowledge of other fermented milks.

Methodology

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Development plan

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Evaluation

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Activity	Evaluation Activity		Percentage final score
	Procedure	Number	(%)
Theoretical classes	Written tests on the theory of the subject program	2	**70**
Problems and cases	Reports on problems and cases	3	**10**
Laboratory	Report	1	**20**
Others			
Total			**100**

Bibliography

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Basic bibliography

- Bamforth, Charles W . 2007. Alimentos, fermentacion y microorganismos. Zaragoza. Acribia.

- Bourgeois, C.M., Larpent, J.P. (1995) Microbiología alimentaria. 2.fermentaciones alimentarias. Acribia. Zaragoza.

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

- Sanchis, V., Orive, M., y Ram os, A.J. (2000). La cerveza. Aspectos microbiológicos. UdL. Lleida.

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

Further reading

- Eck, A., Gillis, J.C. (1997). Le fromage. 3ª ed. Tec&Doc. London

- Fermentation microbiology and biotechnolog y. 2006. El-Mansi [et al.] 2nd ed. London. Taylor & Francis cop.

- Food fermentation. 2005. Rob M.J. Nout, W illem M. De Vos, Marcel H. Zwietering. Wageningen Academ ic 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. W ood. 2nd ed. London. Blackie Academic & Professional cop.