

Faculty of Biological, Agronomic and Environmental Engineering

BRAL2101 Biochemistry of food industries

[45h+30h exercises] 6 credits

Teacher(s): Sonia Collin, Laurence, Marie-Paul Gijs, Yvan Larondelle, Laurent Mélotte
Language: French
Level: Second cycle

Aims

The course brings the necessary knowledge to the understanding of the biochemical phenomena associated with the production of foodstuffs. At the end of this course, the students will be able to manage operations implementing enzymatic activities of vegetable origin (malting, mashing) or microbiological origin (yeast or bacteria).

Main themes

The course is divided into three theoretical and two practical parts.

A- Biochemistry of yeast fermentation (1.5 ECTS): characterization of yeasts, assimilation and transformation of nutrients (sugars, amino acids...), products excretion, illustrated mainly within the field of the brewery.

B- Biochemistry of bacterial fermentations (1 ECTS): description of the bacteria used in food industries, applied biotechnology.

C- Biochemistry of malting and mashing (1.5 ECTS): description of cereals, processes of malting and mashing.

D- Practical work on biochemistry of cereals (1 ECTS): exercises related to part C.

E- Practical work on biochemistry of fermentation (1 ECTS): exercises related to part A

Content and teaching methods

Part A describes the use of *Saccharomyces cerevisiae* in brewery. The brewer's yeast is studied in terms of cell wall (flocculation), plasma membrane (transport, fermentative power), assimilation of sugars, assimilation of amino acids, fermentation by-products excretion and finally, maturation and lagering of beer.

Part B deals with bacterial fermentations: alcoholic, lactic and acetic (including acetogenesis) fermentations, including additional aspects related to food productions (antibiotic...). This part is also devoted to the signalling and regulation of these bacterial metabolic pathways.

Part C illustrates the use of the vegetable enzymes obtained by germination (barley malting). The malting steps (steeping, germination and kilning) are described from the biochemical point of view (physiology of seed, biochemistry of germination...). In addition, degradation of the starch from the barley and/or from other cereals (unmalted grains) are explained within the framework of the beer mashing.

Part D resumes the practical work devoted to malting (viability and vitality barley, modification of malt) and with the mashing of a beer (conventional mash, measurements of the enzymatic activities...).

Part E covers practical work dedicated to the biochemistry of brewer's yeast (flocculation, viability, fermentative power...).

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Precursory courses Basic biochemistry

Supplemental courses Foodstuff chemistry, Food technology

Evaluation Examinations, Practical work reports

Support Multimedia, notes

Teaching team Professors, assistants

Miscellaneous Practical works from parts D and E require the theoretical parts C and D respectively