UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Biochimica delle Sostanze Naturali

2223-1-F0601Q106

Aims

The teaching of Biochemistry of natural substances aims to provide knowledge about the secondary metabolism of plants, with particular insights into the applications of secondary metabolites in the pharmacological, nutraceutical and food fields.
1.Knowledge and understanding - the course provides in-depth knowledge about the mechanisms of the biosynthesis of natural products and the metabolic pathways involved.
2. Ability to apply knowledge and understanding - by the end of the course students will have acquired scientific knowledge about the metabolic pathways of plants and their role in human health and will be able to understand the link between secondary metabolites and applications in the pharmacological and nutritional fields.
3. Judgment autonomy - the knowledge acquired during the course will give students the skills to evaluate the different categories of secondary metabolites as bioactive molecules to be used as drugs, nutraceuticals and foods.
4. Communication skills - at the end of the course, students will have acquired the ability to present the topics covered orally with properties of language.
5. Learning skills – at the end of the course, students will have acquired the ability to critically read and discuss the scientific literature relevant to the topics.

Contents

Distribution and characterization of natural substances in plants. Synthesis and accumulation sites. Role of secondary metabolites in plant defense mechanisms. Biosynthesis of simple and complex phenolic compounds. Biosynthesis of terpenoids, from monoterpenes to polyterpenes. Alkaloids, cyanogenic glucosides and glucosinolates. Pharmacological and nutritional applications of secondary metabolites.

Detailed program

The course of Biochemistry of natural substances has as its main objective the acquisition of the processes that regulate the biosynthesis of the main secondary metabolites from plants of pharmacological and nutraceutical interest, also considering their role in the defense mechanisms of plants. In the first part the reactions involved in the main metabolic pathways and the main classes of primary metabolites (lipids, carbohydrates, nucleic acids and proteins) will be treated. General scheme of plant metabolism. Main metabolic pathways involved in the synthesis of secondary metabolites and classification. Terpenes, biosynthetic pathway and biological role. Plant steroids and structural characteristics. The biochemical pathways that lead to the synthesis of phenolic compounds. Flavonoids (flavonols, isoflavones, flavans, flavones, flavonones) and phenylpropanoids. Resveratrol: a polyphenolic stilbene with antioxidant activity. Alkaloids, cyanogenic glucosides and glucosinolates: biosynthetic pathways, structural elements, classification and biological properties. Aquatic autotrophic organisms: sources of bioactive molecules with high added value. During the course, scientific publications will be discussed in order to identify some of the metabolites described as bioactive molecules to be used as drugs, nutraceuticals and foods. Particular emphasis will be given to the biological pathways involved. Compatibly with the availability of access, some lessons may be held at the Vivaio Bicocca. The topics of this course are strictly connected with the theme of ecological transition and with the "One health laboratory: from the environment to health" of the second semester of the Biology degree course in which bioactive compounds, extracted from biological matrices, will be tested in specific cellular systems.

Prerequisites

The student who attend the course must have a good knowledge on the main classes of natural organic substances treated in the basic courses of organic chemistry and biochemistry.

Teaching form

Frontal lessons with powerpoint presentations; participated lessons and interactive teaching.

Textbook and teaching resource

Recommended texts:
Paul M. Dewick “Chemistry, biosynthesis and activity of natural substances” Piccin
Scientific articles in pdf.
The slides of the lessons will be uploaded to the Moodle platform.

Semester

First semester.

Assessment method

Profit will be assessed through an oral exam, in which the student's ability to connect the different topics in a critical

way will be assessed through 3-4 questions. There are no ongoing tests.

Office hours

By appointment writing to the teacher (paola.coccetti@unimib.it)

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION