UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Plant Bioprospecting

2526-1-F0602Q099

Aims

Knowledge and skills: Medicinal products, foods and new material are usually of plant origins. The knowledge of plant biodiversity and evolution allows the discover of new compounds and phytocomplexes useful for different applications. The first aim of the present course is to provide tools useful to deepen the topic of plant biodiversity, adaptation and competition in complex ecosystems. The second aim is to understand the potential of bioactive phytochemicals (bioprospecting) acting a signals in nature and representing at the same time a resource for different industries (e.g., cosmetics, food supplements, agri-food supply chain).
Knowledge and applied skills: The course will allow students to learn about biodiversity analysis methods, and practic strategies to perform bioprospecting type analyses.
Autonomy of judgement: To interpret information about biodiversity to propose strategies for the safeguard and valorization of plants also with regard to their original territory.
Communication skills: The couse is intended with the aim of providing students the skills to effectively communicate, in a proper and specific way, topics dealing with plant biodiversity, conservation and the valorization of the plant metabolic richness.
Learning skills: By the end of the course, the student will be required to autonomously disentagle the topics deepened within the course, including the possibility of actively interacting with experts in the sector or by consulting websites and/or specific bibliographic resources.

Contents

The present course concerns the study of plant biodiversity starting from the analysis of the evolutionary traits that allowed algae the colonization of land surfaces and their subsequent evolution up to the current flowering plants, by posing a particular focus on the metabolic pathways characterizing the different evolutionary phases. The bioprospecting approach will allow to interpret the biodiversity topics with a practical purpose, that is to identify new compounds, genes, metabolic pathways and phytocomplexes useful to several industrial applications.

Detailed program

The biodiversity as a source of bioactive compounds.
The origin of life, the evolution of organisms and the metabolic diversity.
Examples of biological compounds with applications in medicine and pharmacology.
The evolution of plants from algae to land surfaces.
The critical steps of plant evolutionary course and the role of the environment in the selection of plant metabolic diversity.
Fungi. Biological cycles and peculiar metabolisms. Examples of applications.
Higher plants: origin and diversification.
The angiosperms and their evolution.
Evo-Devo and the development biology of plant organs.
The Italian flora: origin and features.
Biomes and biodiversity safeguard interventions.
Bioactive compounds as agents of communtication for plants with the ecosystem.
Classification and evolutionary diversification of bioactive compounds.
Bioprospecting.
Approaches for the study of bioactive compounds.
Methods for the extraction, analysis, identification and quantification of bioative compounds in plant matrixes.
The application of phytochemicals in commercial products: food supplements, cosmetics, herbicides medicinal products, drugs.
Fundamentals of circular economy.
The "One Health" concept and the role of phytochemistry in the link between environmental and human health: examples and case-studies.
Analysis of an active compound (such as Aspirin) in the titration of an over-the-counter medication.

Prerequisites

Botany. Basic knowledge of Plant Physiology and Sistematic Botany.
The lecturer will provide for supportive documentations (slides, texts and interviews) if required.

Teaching form

The course will be dispensed mostly by frontal teaching (80%) and partly interactively (20%), both in presence. Moreover, whenever the number of students continuously attending should be equal or higher than 10, the course will forecasts visits companies producing phyoextracts and herbal products.

Textbook and teaching resource

The slides shown along the course lessons will be provided on the e-learning platform.
Scientific papaers and textbooks willbe suggested in the slides and by the lecturer.

Semester

Second semester

Assessment method

The exam is written and is aimed at assessing the student's knowledge about plant biodiversity, the metabolic pathways characterizing plant evolutionary stages and the exploitation of plants through bioprospecting.
The exam consists of 3 questions. The first question is of a general nature on the topics of the course and aims to evaluate the study method and the student's level of detail. The second question is aimed at assessing the student's ability to understand the main plant evolutionary stages. Particular attention will be devoted to the evaluation of the interpretation of plant metabolic pathways from the evolutionary point of view. The last question is aimed at assessing the critical ability of the student in the analysis and resolution of issues related to bioprospecting both from the technical and applicative point of view.
It is possible to access to an oral part if required by the student.
Intermediate exams are not foreseen.
Evaluation criteria: scientific and technical knowledge about plant metabolic diversity and bioprospecting, critical capacity and individual re-elaboration, communication skills and correct use of technical language.

Office hours

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Sustainable Development Goals

ZERO HUNGER | GOOD HEALTH AND WELL-BEING | CLIMATE ACTION