UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biology of Plant Adaptation

2627-1-F0602Q113

Aims

This course will focus on the relationship between plants and environment and how this relates to practical applications that based on green plants can be useful to improve the environment. By the end of the term, students will be able to:

1. Describe the main processes involved in thet interaction between plants and environment;
2. Explain how mechanisms controlling interaction with the environment can be used for different applications (agriculture, energy, environmental protection, etc.);
3. Apply the learned concepts to other courses or toward work in the field of plant biology and environmental sciences;
4. Critically consider the implications of using and manipulating plant adaptation to stress conditions to meet current human needs;
5. Communicate their understanding of the presented topics using accurate scientific language and technical terminology.

Contents

This course will describe the main processes involved in plant responses to environmental stresses. The use of plants to improve the quality of the environment will be explored, including their potential to develop new technologies (phytoremediation, bioenergy, biorefinery, etc.) to reduce pollution and alleviate our dependence on non-renewable energy sources.

Detailed program

The main environmental factors affecting plant growth and development. Light: photosynthetically active radiation (PAR); the role of light in photosynthesis and morphogenesis; shade tolerant and shade intolerant plants; plants morphological and physiological adaptations to high and low light availability. Air temperature. Morpho-physiological adaptation strategies of plants to high and low temperatures. Plant water relations. Water potential and water transportation within the plant. Strategies and adaptations of plants to drought and waterlogging. The soil and mineral nutrition. Effects of nutrient shortage on plant's growth. Morphological and physiological adaptations of plants to high soil salinity (halophytes), heavy metals (hyperaccumulators). Symbiosis as an adaptation strategy: Definitions. Symbiosis between the root system and bacteria, symbiosis between plants and cyanobacteria, mycorrhizae and lichens. Secondary Metabolites in Plants: Definition and Classification. Terpenes, Phenolic compounds and Nitrogen-containing secondary metabolites: classification, composition and their biological functions. Adaptations of plants to extreme environments: rocky outcrops and rock walls (chasmophyte and comophyte), sandy substrates (psammophyte)

Practical applications of plant ecophysiology. Food production; the potential of halophyte plants in saline agriculture. Environmental protections: the use of plant to clean-up polluted soil and water, phytoremediation.

Prerequisites

Acquainted with botany and plant physiology

Teaching form

Lecture (6 credits). Lectures will be held in Italian language in person (no streaming). Registrations will be made available for the students.

18 lectures will be held in person;
1 lectures will be in person training activities;
2 lab activity will consist in seminars organized by the students on topic related to the course

Textbook and teaching resource

Luigi Sanità di Toppi - Interazioni piante-ambiente – Piccin Editore 2018

Loretta Gratani - Appunti di Ecologia Vegetale, Aracne 2015

Reading material provided by the teacher (ppt slides in Italian)

Semester

First semester

Assessment method

Oral
For the exam, students will discuss a topic of their choice and a question posed by the instructor. No intermediate evaluation is foreseen. The accurate use of scientific language to explain the topics and the ability to relate them will also be evaluated. Intermediate assessment will not be performed.

Office hours

By appointment

Sustainable Development Goals

CLIMATE ACTION | LIFE ON LAND