

Biology Msc from 2018

Name of the specialisation:

Plant Biology (PB)

OVERVIEW OF THE FIELD

Plant biology focuses on the anatomy, physiology, ecophysiology of plants along with their interactions to other organisms such as fungi. A broad field of science that covers not only laboratory work like plant molecular biology, breeding and agrarian biotechnology but also plant stress physiology and open field investigations such as ecophysiological studies, mycorrhiza and endophyte research. Nevertheless plant biology is also in connection with analytical chemistry and atomic physics (plant ionomics), pharmaceutical sciences (pharmacobotany), and applied agrarian and forestry sciences.

TEACHING CONTENT

The specialisation offers theoretical and practical courses in a broad field of plant science including molecular biological and biotechnological techniques (expression analysis, proteomic techniques, tissue culture, transformation, gene editing), instrumental physiological and microscopy methods (photosynthesis research, light and fluorescence microscopy, X-ray fluorescence microscopy, electron microscopy), field investigations and nature conservation studies. Selected topics of the specialisation:

Bioactive ingredients of plants and fungi: Special metabolites of plants and fungi, their extraction and separation using chromatographic techniques and testing their bioactivity.

Plant ionomics: Instrumental element analytical and ionom mapping techniques studying the element content, distribution and pattern in plants.

Molecular plant biology laboratory project work: The latest DNA and RNA investigation techniques in plant science including expression analysis studies.

RESEARCH PERSPECTIVES

The greatest challenge of the 21st century will be the increasing human population of the world and the changing climate, the extremities of which are affecting not only the agronomy but the natural flora as well. Plant biology is aimed to understand and answer these challenges. Ongoing research projects of the departments participating in the specialisation cover topics from ecological and plant-fungus interaction studies (at inland and Bulgarian sites) to laboratory, molecular plant science investigations.

Endophyte fungi: Plants form symbiosis with various non-pathogenic fungi such as endophytes living in their tissues. Although endophytes colonise plants symptomless their impact on the host organisms especially on the vitality and stress tolerance of plants is hardly known.

Mycorrhizal fungi: Except only a few cases plant form an anatomical-functional structure with fungi called mycorrhiza. To understand the function, operation of this symbiotic relationship together with its impact on the stress tolerance of plants is in focus of ongoing research projects.

Plant stress physiology: Plants, including agricultural plants are under pressure of various biotic (virus infections, pathogenic attack) and abiotic (salinity and drought) stress factors that limits their vitality and biomass and crop production. Ongoing investigations using molecular, microscopic and instrumental physiological techniques focus what kind of answers are activated in the presence of certain stressors and what kind of hardening and protecting mechanisms including changes in the gene activation pattern have a role in tolerating these stressors. These investigations also help us understand what kind of genetic alterations can lead to an enhanced stress tolerance of agricultural plants.

Plant biotechnology: Plant breeding is challenged by the increasing human population and enhanced environmental extremities. Molecular plant breeding investigations contributes to understand the role, structure and ratio of the storage nutrients (proteins, carbohydrates, micronutrients) in seeds of cereals that affects the rheological properties and nutritive quality of breads. Moreover, these investigations also help us to decrease the allergic protein components in the flour.

Nevertheless, seeds of cereals can store recombinant proteins for pharmaceutical (molecular farming) and veterinary aims (edible vaccines) in a high amount.

Pharmacobotany: The investigations of bioactive plant and fungal metabolites are among the most important pharmaceutical research topics. The purification and biosynthesis studies of these compounds contribute in the development of new pharmaceutical components.

Metal homeostasis of plants: Vitality and biomass production of plants are strongly affected by their microelement nutritional status such as the availability and presence of iron. These elements are not only important in nutritional status of edible crops but the understanding of their homeostasis is also important in the agronomic treatment of deficiency symptoms.

TEACHERS AND RESEARCHERS

Department of Plant Physiology and Molecular Plant Biology:

Ferenc Fodor: his main research topic is the iron homeostasis: its uptake, translocation and distribution in plants, investigated by instrumental physiological and plants ionom research techniques.

Ádám Solti: his investigations focus on the photosynthetic activity of plants and the operation and transport functions of the chloroplast envelope membranes, especially their iron uptake processes. In his investigations he is using instrumental physiological, as well as membrane isolations, protein separation and expression analysis techniques.

László Tamás: he studies the storage proteins of edible agronomic plant especially cereals using molecular biological techniques. The research projects focuses on the complexity and role of the storage proteins, along with the industrial an pharmaceutical possibilities in the accumulation of recombinant proteins in the seeds of cereals.

Department of Plant Anatomy

Imre Boldizsár: his investigations focus of the identification and quantification of flavonoids and lignane components of plants that are involved in their iron metabolism or have a pharmaceutical activity. He uses various chromatographic techniques.

Gábor M. Kovács: his main research topic is the ecology and taxonomy of endophyte fungi in plants that covers environmental samplings, microscopic investigations and molecular biological techniques.

Katalin Solymosi: she studies the physiological and anatomical properties of the transformation of etioplasts to chloroplasts, along with the reaction of plants to elevated salinity. She uses microscopic techniques and photosynthesis activity measurements in her studies.

CARRIER OPPORTUNITIES

Plant biological studies help the applicant in their further carrier not only in the field of agrarian biotechnology and pharmaceutical industry but also in nature conservation and national parks. former students of the specialisation won doctoral and post-doctoral grants or got employed at European and overseas universities (Ludwig-Maximilian Universität, München, University College of Dublin, Harvard University) as well as inland universities and research institutes (Semmelweiss University, Saint Stephan University, University of Veterinary Sciences, Agrarian Research Centre of the Hungarian Academy of Sciences, Agricultural biotechnological research Institute), but also in the private sector (Tata, Inc., Richter-Gedeon Ltd.), at Hungarian national parks and in the science administration.