



ЦЕНТЪР ЗА ОБУЧЕНИЕ – БАН

1000 София
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Basic Information:

Course Title: **Plant Biotechnology**

Lecturer: Assoc. Prof. Krasimira Tasheva, PhD

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Total Teaching Hours: 30 teaching hours

Annotation (up to 150 words)

The course is intended towards a wide range of specialists (students, graduates, PhD students) working in the field of plant sciences. The course provides basic knowledge on *in vitro* cultivation and plant biotechnology. The ability of isolated plant cells to differentiate and form whole plants is the basis of plant biotechnology. *In vitro* techniques and manipulations are already widely used in contemporary practice. Micropropagation is a profitable industry. Reconstruction of the plant genome by somaclonal variation, mutagenesis, somatic hybridization (fusion of protoplasts) and/or genetic transformation provides new forms with valuable economical qualities (e.g. disease resistance, drought, etc.) which enrich the gene pool. The biotransformation reaction and modeling of gene expression are used for higher production of valuable metabolites, synthesis of specific substances important for the industries (pharmaceutical, food, chemical, etc.), as well as for environmental protection.

Course content:

Topic / Module 1: *In vitro* plant cultivation: fundamentals of plant tissue culture, aseptic techniques, culture media, and the role of phytohormones.

Topic / Module 2: Micropropagation and regeneration: stages of micropropagation, organogenesis and somatic embryogenesis, factors influencing successful regeneration.

Topic / Module 3: Plant biotechnology and genetic variability: somaclonal variation, mutagenesis, somatic hybridization, and genetic transformation.

Topic / Module 4: Biotransformation and secondary metabolites: production of biologically active compounds through *in vitro* cultures and their industrial applications.

Teaching and assessment methods

Teaching methods: Lectures and practical exercises delivered in a face-to-face format.

Assessment methods: Evaluation is based on a written examination followed by discussion, or on a student presentation followed by discussion.

Competencies acquired as a result of training (3–5 points)

1. Knowledge of the fundamental principles and techniques of plant *in vitro* cultures and their application in biotechnology.
2. Skills in handling aseptic cultures, preparing culture media, and controlling conditions for plant growth and regeneration.
3. Ability to interpret processes of morphogenesis, micropropagation, and plant regeneration.
4. Understanding of the main approaches in plant biotechnology, including genetic variability and transformation.



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5. Knowledge of the applications of *in vitro* systems for the production of biologically active compounds and for the conservation of plant biodiversity.

Literature:

1. Chawla H.S. Introduction to Plant Biotechnology, 3rd Edition, Science Publisher, 2009
<https://bcrti.co.in/digitallibrary/includeFolder/noticeFolder/211111032202117.pdf>
2. Plant Biotechnology and Genetics: Principles, Techniques, and Applications. Edited by C. Neal Stewart, Jr., Published by John Wiley & Sons, Inc., Hoboken, New Jersey, 2008 <https://content.e-bookshelf.de/media/reading/L-7644859-fdec41eb44.pdf>
3. Medicinal Plant Biotechnology. Edited by Oliver Kayser and Wim J. Quax, 007 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim,
<https://uodiyala.edu.iq/uploads/PDF%20ELIBRARY%20UODIYALA/EL34/Medicinal%20Plant%20Biotechnology.pdf>
4. Majhi S., Hossain E., Agrahari D., Devi R.S. Modern Approaches in Medicinal Plants and Plant Taxonomy; 2025; ISBN: 978-81-995474-1-4 <https://zenodo.org/records/18110600>
5. Gan WC, Ling APK. CRISPR/Cas9 in plant biotechnology: applications and challenges. BioTechnologia (Pozn). 2022 Mar 24;103(1):81-93. doi: 10.5114/bta.2022.113919. PMID: 36605382; PMCID: PMC9642946. <https://pmc.ncbi.nlm.nih.gov/articles/PMC9642946/>
6. Йонкова И., Основи на фармацевтичната растителна биотехнология, МУ-София, 2009

Additional information (optional) (e.g., special requirements, laboratory equipment, prior knowledge)