

Tárgytematika / Course Description

Plant biotechnology

N_DMA05
Tárgyfelelős neve /
Teacher's name: dr. Molnár Zoltán

Félév / Semester: 2024/25/2

Beszámolási forma /
Assesment: Vizsga

Tárgy heti óraszám /
Teaching hours(week): 0/0/0

Tárgy féléves óraszám /
Teaching hours(sem.): 20/0/0

OKTATÁS CÉLJA / AIM OF THE COURSE

The concept, areas, subject, purpose, methods, and history of plant biotechnology. Plant somatic cell cultures, callus culture. Plant regeneration (morphogenesis): physiological basis, organogenesis, somatic embryogenesis. Cultivation of plant protoplasts: isolation and cultivation of protoplasts. Somatic hybridization: protoplast fusion, identification of hybrid cells, plants. Isolation of mutants from cell and tissue cultures. Somaclonal and gametoclonal variability. The importance of plant genetic engineering. Molecular structure of plant genes. Identification of plant genes, gene maps. Recombinant DNA technique. *In vitro* recombination. Identification of plant genes. Gene cloning, clone library, clone selection. Gene transfer systems. Steps of transgenic plant production. Gene transfer methods in plants. Plant biotechnology and plant breeding: biotechnology for sexual reproduction (haploid cultures: ovary, ovulum, anthers, microspore, *in vitro* pollination and fertilization, triploid cultures), embryo cultures (embryo development *in vivo*, embryo development *in vitro*: pregerminal and postgerminal cultures), vegetative organ cultures (root cultures, leaf cultures, meristem cultures). Plant biotechnology and propagation material production: *in vitro* vegetative micropropagation, artificial (synthetic) seed, virus removal and plant biotechnology, *in vitro* gene bank. Plant biotechnology and plant protection: pathogen-resistant transgenic plants, pest-resistant transgenic plants, herbicide-tolerant transgenic plants. GM crops in agriculture: advantages and disadvantages. Risk factors for plant genetic engineering. Legal regulation of plant genetic engineering. The economic importance of GM crops.

TANTÁRGY TARTALMA / DESCRIPTION

1	Introduction; the concept, subject, purpose, and classification of plant biotechnology
2	Plant somatic cell cultures, callus culture; plant regeneration, organogenesis, somatic embryogenesis
3	Plant protoplast culture, somatic hybridization: protoplast fusion, hybrid cells, plant identification
4	Isolation of mutants from cell and tissue cultures; somaclonal and gametoclonal variability
5	The importance of plant genetic modification; molecular structure of plant genes; identification of plant genes, gene maps
6	Recombinant DNA techniques; <i>in vitro</i> recombination; gene transfer systems
7	Transgenic (GM) plant production; gene transfer methods in plants
8	Plant biotechnology and plant breeding 1: biotechnology of asexual reproduction (haploid breeding)
9	Plant biotechnology and plant breeding 2: embryo cultures, vegetative organ cultures
10	Plant biotechnology and propagation material production 1: <i>in vitro</i> vegetative micropropagation
11	Plant biotechnology and propagation material production 2: artificial (synthetic) seeds, virus removal and plant biotechnology, <i>in vitro</i> gene bank
12	Plant biotechnology and plant protection; GM crops in agriculture: advantages and disadvantages

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESSMENT'S METHOD

Written examination, graded on a 5-point scale.

KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL

- Prasad, B.D., Sahni, S., Kumar, P., Siddiqui, M.W. (2018): Plant Biotechnology, Volume 1: Principles, Techniques, and Applications. Apple Academic Press, Oakville–Waretown, Canada, and USA.
- Sahni, S., Prasad, B.D., Kumar, P. (2018): Plant Biotechnology, Volume 2: Transgenics, Stress Management, and Biosafety Issues. Apple Academic Press, Oakville–Waretown, Canada, and USA.
- Stewart, C.N., Jr. (Ed.) (2016): Plant Biotechnology and Genetics: Principles, Techniques, and Applications, 2nd Edition. Wiley-Blackwell, Oxford–Hoboken, UK, and USA.
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AJÁNLOTT IRODALOM / RECOMMENDED MATERIAL

- Christou, P., Klee H. (Eds.) (2004): Handbook of Plant Biotechnology. Wiley-Blackwell, Oxford–Hoboken, UK, and USA.
- Davey, R.M., Anthony P. (Eds.) (2010): Plant Cell Cultures. Essential Methods. Wiley-Blackwell, Oxford–Hoboken, UK, and USA.
- George, E.F., Hall, M.A., De Klerk, G.J. (2008): Plant Propagation by Tissue Culture, 3rd Edition. Springer, Berlin Heidelberg.
- Neumann, K.H., Kumar, A., Imani, J. (2009): Plant Cell and Tissue Culture – A Tool in Biotechnology. Springer, Berlin Heidelberg.