Sveučilište u Zagrebu Agronomski fakultet
Svetošimunska cesta 25, 10000 Zagreb
Telefon: +385 (0)1 2393 777
E-mail: dekanat@agr.hr
Web: www.agr.unizg.hr

Plant Biotechnology (296613)

Nositelj kolegija

prof. dr. sc. Snježana Kereša

Opis kolegija

Plant biotechnology is a discipline that encompasses a variety of in vitro methods of breeding and rapid vegetative propagation of plants, and some of these methods, such as micropropagation have been for decades routinely used in the commercial production of seedlings of various plants, especially ornamentals and fruits. Genetically modified varieties of plant species whose commercial production dates back about 20 years also are the result of research in plant biotechnology. Therefore to the techniques of recombinant DNA and genetic modification of plants, from description of the methods to the modification of different properties of different species are dedicated a number of lectures and seminar. In addition to these topics in the module Plant biotechnology students will learn the basic principles of plant tissue culture with a focus on ways to regenerate plants in vitro, the cell suspension, the preservation of genefond in in vitro conditions, the development of genetic variability through somaclonal variation and protoplast fusion, the methods of obtaining haploids and double haploids as a method of accelerating the selection process, and the use of molecular markers in plant breeding. Laboratory exercises consist of the preparation of culture media for plant tissue culture, sterilization of plant material, incision of meristem under the stereomicroscope, and inoculation of explants for micropropagation. Exam is conducted through two partial tests of knowledge or final written exam.

ECTS: **6.00**

E-učenje: **R1**

Sati nastave: 60
Predavanja: 46
Laboratorijske vježbe: 8
Seminar: 6

Izvođač predavanja

- prof. dr. sc. Snježana Kereša
- prof. dr. sc. Ivan Pejić
- izv. prof. dr. sc. Anita Bošnjak Mihovilović

Ocjenjivanje

Dovoljan (2): 60-70 %
Dobar (3): 71-80 %
Vrlo dobar (4): 81-90 %
Izvrstan (5): 91-100 %

Vrsta kolegija

- Graduate studies / MS Courses taught in English (Izborni kolegij, 2. semestar, 1. godina)

Developed by Superfluo d.o.o. • www.superfluo.hr

Sveučilište u Zagrebu Agronomski fakultet
Svetošimunska cesta 25, 10000 Zagreb
Telefon: +385 (0)1 2393 777
E-mail: dekanat@agr.hr
Web: www.agr.unizg.hr

Opće kompetencije

After completion of lectures and exercises in this module, students are prepared to work independently eg. in a commercial laboratory for micropropagation of plants or lead such a laboratory. They are ready also for teamwork in biotechnological research laboratories in breeding houses. Based on the knowledge gained about genetically modified plants, students are ready to plan properly and keep growing conventional crops in coexistence with GM crops.

Oblici nastave

- Lectures
- Laboratory practice/exercises
  Laboratory exercises are implemented through four exercises for two hours in small groups. During exercises students prepare culture media for plant tissue, prepare explants for the initiation of culture in vitro (surface sterilization), subcultivate nodal segments for micropropagation by axillary branching, and isolate the meristem for setting in culture
- Seminars
  Independent work at home, and then as the work in the classroom; students divided into two groups debate about genetically modified plants. For the quality of the debate student's preparation in groups is necessary according to previously obtained materials

Ishodi učenja i način provjere

Ishod učenja	Način provjere
Define the concepts of modern plant biotechnology, plant tissue culture, callus culture, somaclonal variation, cell suspension, micropropagation, recombinant DNA, genetic modifications	Partial tests of knowledge, final written exam
Bundle and describe methods of plant regeneration in tissue culture, micropropagation of plants, methods of long-term storage of vegetative parts of plants, methods of genetic modification of plants, isolation and fusion of protoplasts and methods of marker assisted selection; explain the purpose of embryo culture, purpose and methods of production of haploids; summarize information about so far bred properties of plants by using somaclonal variation and genetic modification	Partial tests of knowledge, final written exam
Use laboratory equipment needed to prepare nutrient media, excise shoot tips (under stereomicroscope) and handle the plant tissue culture under sterile conditions	Partial tests of knowledge, final written exam
Compare the advantages and disadvantages of genetic modification in relation to the classical plant breeding	Partial tests of knowledge, final written exam
Propose which method of plants healing from viruses and micropropagation use for certain plant species; propose which method of haploid and double haploid production use to shorten the process of plant breeding	Partial tests of knowledge, final written exam
Judge the benefits and risks of genetically modified (GM) plants	Seminar, participating in the debate

Developed by Superfluo d.o.o. • www.superfluo.hr

Sveučilište u Zagrebu Agronomski fakultet
Svetošimunska cesta 25, 10000 Zagreb
Telefon: +385 (0)1 2393 777
E-mail: dekanat@agr.hr
Web: www.agr.unizg.hr

Način rada

Obveze nastavnika

Orderly maintenance of all forms of teaching; all teaching materials are available in the Merlin system for e-learning; communication with students (notice, the results of the exam) through Merlin system.

Obveze studenta

Attending lectures, laboratory exercises and seminars is mandatory.

Polaganje ispita

Elementi praćenja	Maksimalno bodova ili udio u ocjeni	Bodovna skala ocjena	Ocjena	Broj sati izravne nastave	Ukupni broj sati rada prosječnog studenta	ECTS bodovi
Attending lectures and exercises				54	54	1.8
First test of knowledge	50%	60-70 71-80 81-90 91-100	Dovoljan (2) Dobar (3) Vrlo dobar (4) Izvrstan (5)		60	2
Second test of knowledge	50%	60-70 71-80 81-90 91-100	Dovoljan (2) Dobar (3) Vrlo dobar (4) Izvrstan (5)		60	2
***Seminar	Depending on the level of knowledge during the debate			6	6	0.2
*Repeating the test of knowledge	(50%)					(2)
(or **Final written exam)	(100%)	60-70 71-80 81-90 91-100	Dovoljan (2) Dobar (3) Vrlo dobar (4) Izvrstan (5)		(120)	(4)
Total	100%			60	180	6

Developed by Superfluo d.o.o. • www.superfluo.hr

Sveučilište u Zagrebu Agronomski fakultet
Svetošimunska cesta 25, 10000 Zagreb
Telefon: +385 (0)1 2393 777
E-mail: dekanat@agr.hr
Web: www.agr.unizg.hr

Elementi praćenja	Opis	Rok	Nadoknada
***Seminar	***Active and well prepared participation in the debate can correct the grade upwards		
*Repeating the test of knowledge	*The student has the right to fix a rating from one test of knowledge (partial exam) or afterwards write one test of knowledge if he was prevented during scheduled examination date; rating scale is the same as in regular examination date		
(or **Final written exam)	**If the student does not pass the subject by means of tests of knowledge, he has to take the final written exam		
Repeating the test of knowledge Final written exam	The exam consists of 20 questions	Exam periods	

Tjedni plan nastave

1. Introduction to plant biotechnology, culture media, the impact of plant material and physical factors on plant tissue culture, ways of plants regenerating in vitro - somatic embryogenesis, organogenesis
2. Methods of cell suspensions, the production of secondary metabolites in cell suspension; Somaclonal variation
3. Techniques of micropropagation, meristem culture for the production of healthy planting material
4. Lab - Preparation, autoclaving and outpouring of culture media in plant tissue containers; sterilization of plant material prior to introduction into the culture, plating of leaf explants
5. Methods of germplasm storage in vitro and by cryopreservation; Methods of isolation and fusion of protoplast
6. Lab - subcultivation of nodal segments for micropropagation by axillary branching
7. Methods of haploid and double haploid production, embryo culture Lab - Isolation of shoot tips under the stereomicroscope and setting up in culture
8. Structure of DNA and chromosomes, DNA replication, regulation of gene expression; First test of knowledge
9. Basic techniques in molecular genetics - DNA isolation, recombinant DNA technology, PCR, electrophoresis, DNA sequencing
10. Methods of genetic modification of plants -vector-mediated and direct gene transfer Methods of genetic modification of plants; differences between transgenesis, cisgenesis and intragenesis
11. Genetic modifications of plants for resistance to pests and diseases
12. Genetic modifications of plants to abiotic stress resistance and other properties; status of the cultivation of GM plants in the world and Europe
13. Application of molecular markers in plant breeding
14. Teamwork in the classroom - studying of the strategy for the co-existence of conventional, GM and ecological crops, preparation for discussion
15. Debate on GM crops and co-existence; Second test of knowledge

Developed by Superfluo d.o.o. • www.superfluo.hr

Sveučilište u Zagrebu Agronomski fakultet
Svetošimunska cesta 25, 10000 Zagreb
Telefon: +385 (0)1 2393 777
E-mail: dekanat@agr.hr
Web: www.agr.unizg.hr

Obvezna literatura

1. Kereša S. (2016/2017) Lectures prepared in Power Point (e-learning - Merlin)
2. Chawla H. S. (2002) Introduction to Plant Biotechnology (second edition). Science Publishers, Inc.
3. Selected scientific papers
4. Slater A., Scott N. W., Fowler M. R. (2008) Plant Biotechnology: the genetic manipulation of plants (second edition). Oxford University Press.

Preporučena literatura

1. Tamarin R. H. (1999) Principles of Genetics (sixth edition). WCB McGraw-Hill.
2. Taji A., Kumar P., Lakshmanan P. (2002) In vitro plant breeding. Food products Press.

Sličan kolegij na srodnim sveučilištima

- Plant Biotechnology, University of Hohenheim, Germany
- Plant Biotechnology, National University of Ireland, Maynooth, Ireland

Developed by Superfluo d.o.o. • www.superfluo.hr