SUBJECT GUIDE

Academic year 2019/2020

TRANSGENIC PLANTS AND FOOD

Revision date: May 14, 2020

MODULE	CONTENT	YEAR	TERM	CREDITS	TYPE
Biology	Transgenic Plants and Food	4th	1	6	Optional

LECTURER(S)	Postal address, telephone nº, e-mail address
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DEGREE WITHIN WHICH THE SUBJECT IS TAUGHT	OTHER POSSIBLE DEGREES
Degree in Science and Food Technology	Degree in Biology

PREREQUISITES and/or RECOMMENDATIONS (if necessary)

It is strongly recommended the student have completed Biology and Biochemistry and be able to translate a scientific journal paper.

BRIEF ACCOUNT OF THE SUBJECT PROGRAMME (ACCORDING TO THE DEGREE)

In vitro cell, tissue and organ culture. Secondary metabolite production in suspension cultures. Recombinant DNA technology. Biotechnological improvement of medicinal plants. Transgenic plants: Molecular farming. Control and modulation of plant secondary metabolism.

GENERAL AND PARTICULAR ABILITIES

General competencies:

- CG1. Ability to communicate successfully in Spanish within the scope of the subject
- CG2. Problem-solving ability
- CG3. Teamwork
- CG4. Ability to apply theoretical knowledge in a particular way
- CG5. Decision making
- CG6. Ethical commitment
- CG7. Ability for analysis and synthesis
- CG8. Critical Thinking
- CG9. Concern for quality

- CG10. Ability for organization and planning
- CG11. Ability to manage information
- CG12. Be able to adapt to new situations
- CG13. Sensitivity to environmental issues
- CG14. Design and project management

Specific Competencies:

- CE2. Knowing the food production models, its composition and physical, physicochemical and chemical properties to determine its nutritional value and functionality
- CE6. To know, understand and apply classical methodology and new technological processes aimed to improve food production and treatment
- CE7. Analyze biological, physical and chemical risks of food chain to protect public health

OBJECTIVES (EXPRESSED IN TERMS OF EXPECTED RESULTS OF THE TEACHING PROGRAMME)

The current limitation of the planet to provide food for a human population continuously increasing demands the search for alternative crops with higher yields, nutritional quality and technical characteristics. Modern Biotechnology (defined by Codex Alimentarius as "Application of in vitro culture techniques, recombinant DNA techniques, direct injection of DNA into cells or organelles, or fusion of cells beyond the taxonomic family, overcoming natural physiological barriers of reproduction or recombination and that are not techniques used in traditional breeding and selection") allows the production of these crops, GM crops. Adequate knowledge of these materials is clearly an important factor in the formation of food technologists.

On the other hand, the risks and limitations of GM crops should be deeply analyzed and food technologists should know in the interest of greater food security

DETAILED SUBJECT SYLLABUS

I. PLANT CELL, TISSUE AND ORGAN CULTURE

1. Introduction to Plant Biotechnology.
2. General methodology of in vitro culture.
3. Morphogenesis and regeneration.
4. Cell cultures.
5. Protoplasts.
6. Somaclonal variation.
7. Vegetative propagation of plants.
8. Plant Breeding.
9. In vitro culture and secondary metabolism.
10. Secondary metabolite production in cell cultures.

II. PLANT GENETIC ENGINEERING

11. Introduction to plant genetic engineering.
12. Recombinant DNA technology.
13. *Agrobacterium* as plant gene vector. I. *Agrobacterium tumefaciens*.
14. *Agrobacterium* as plant gene vector. II. *Agrobacterium rhizogenes*.
15. Plant viruses as gene vectors.

16. Direct gene transfer methods. Biolistics and electroporation.
17. Genetic engineering applications. I. Improved production of food crops.
18. Genetic engineering applications. II. Enhanced nutritional value of plant products.
19. Genetic engineering applications. III. Improvement of technological characteristics of plant products
20. Impact of Plant Genetic Engineering.

LABORATORY CLASS

Lab 1. Culture media preparation (two sessions).
Lab 2. Callus initiation from carrot root and potato tuber.
Lab 3. Organogenesis from Petunia leaf explants.
Lab 4. Hairy roots induction by *Agrobacterium rhizogenes* infection on carrot root and potato tuber explants.

READING

- *Azcón-Bieto y Talón (2008) Fundamentos De Fisiología Vegetal (2ª Ed). Interamericana-McGraw-Hill, UBe, Madrid*
- *Bhojwani M.K. and Razdan M.K. (1996): Plant Tissue Culture. Ed. Elsevier.*
- *Buchanan B.B., Gruissen W. y Jones R.L. (2015): Biochemistry and Molecular Biology of plants (2nd ed.) Am. Soc. of Plant Physiologists. Rockville, Maryland, USA.*
- *Caballero JL, Valpuesta V y Muñoz Blanco J. (2001). Introducción a la Biotecnología Vegetal: Métodos y Aplicaciones. Ed. Publicaciones Obra Social y Cultural CajaSur.*
- *Charla H.S. (2009). Introduction to Plant Biotechnology. Ed. Science Publisher.*
- *Faye L and Gomord V (2009) Recombinant Proteins from Plants. Ed. Humana Press*
- *Germano Fett-Neto A. (2010) Plant Secondary Metabolism Engineering. Ed. Humana Press*
- *Hall R D (1999) Plant Cell Culture Protocols. Ed. Humana Press.*
- *Izquierdo M. (2001): Ingeniería Genética y Transferencia Génica. Ed. Pirámide.*
- *Kole Ch, Michler Ch H, Abbott A G and Hall T C (2010) Transgenic Crop Plants (Principles and Development) Ed. Springer.*
- *Neumann KH, Kumar A and Imani J (2009). Plant Cell and Tissue Culture, a Tool in Biotechnology. Ed. Springer.*
- *Oksman-Caldentey KM and Barz W H (2002) Plant Biotechnology and Transgenic Plants. Ed. Marcel Dekker, Inc.*
- *Peña L (2005) Transgenic Plants (Methods and Protocols). Ed. Humana Press.*
- *Perera J. y Tormo J.L. (2002): Ingeniería Genética, Volúmenes I y II. Ed. Síntesis.*
- *Slater A, Scot, NW y Fowler MR (2008): Plant Biotechnology: The Genetic Manipulation of Plants. (2ª ed.). Oxford University Press*
- *Taiz L. et al. (2015): Plant Physiology and Development (6th ed.). Sinauer Associates, Sunderland, MA, USA.*

RECOMMENDED INTERNET LINKS

All the links included in the appropriate section of the following web pages:

- http://www.ugr.es/local/fisiofar/
- http://www.ugr.es/local/fisioveg