



FICHA MEMORIA DOCENTE
Curso Académico 2006/07

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CODE	3901	COURSE NAME/TITLE	VEGETABLE PLANT BREEDING						
DEGREE	Engineer in Agronomy					TYPE	Optional		
ORIENTATION	All orientations								
ESTUDIES PROGRAM	1999	CYCLE	2	COURSE	5	SEMESTER	9	FOUR-MONTH PERIOD	A

DEPARTMENT ⁽¹⁾	- Biotechnology -								
AREA ⁽¹⁾	-Genetics -								
COURSE COORDINATOR ⁽¹⁾									
TEACHING STAFF									

⁽¹⁾ En el caso de haber **más de un departamento ó área** que imparta docencia en la asignatura, rellenar **una ficha para cada uno de ellos y una conjuntamente firmada por los responsables y directores de todos ellos.**

TOTAL CREDITS:	4.5		
TOTAL THEORY	2.25	TOTAL PRACTICE	2.25
T. AULA (TA) CLASSROOM	1.95	P. AULA (PA) CLASSROOM	0.75
T. SEMINARIO(TS) SEMINAR	0.30	P. INFORMATICA ⁽³⁾ (PI) LABORATORY	0.45
T. TUTORIZADA ⁽²⁾ (TT) TUTORIALS		P. LABORATORIO LABORATORY PRACTICE	0.45
		P. CAMPO FIELD WORK	0.60
		P. TUTORIZADA ⁽²⁾ (PT) TUTORIALS	

⁽²⁾ Únicamente en el caso de asignaturas con actividades programa de innovación educativa y convergencia europea (PAEEES)

⁽³⁾ Especificar si los créditos se imparte en aulas de la Escuela o del Departamento

Valencia, a 18 de Junio de 2007

Fdo.	Fdo.	Fdo.
Fdo.	Fdo.	Fdo.
Firmas del profesor/es responsable y del Director/es del Departamento		



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«ASI» «NOMASI»

«DEP»/ «v_dptos»
«v_areas»

COURSE TITLE: VEGETABLE PLANT BREEDING

OBJECTIVES

The main objective is that at the end of the course the students know deeply the specific problems and the characteristics of plant breeding of horticultural crops. They also have to know the repercussion that the new techniques, such as molecular markers and genomics, have on the development of breeding programmes and the development of new varieties.

EVALUATION

A continuous evaluation system will be conducted, consisting of 4 written examinations about the content of the theoretical classes given by the teacher. The mark obtained will represent 50% of the final mark.

Each student will participate with other students in an oral presentation about a topic selected by the teacher, who will facilitate the bibliography related to the topic. The mark obtained will represent 30% of the final mark.

A total of four oral presentations will be done during the course. The students will have to present an abstract of the presentations in which they do not participate as speakers. The mark obtained in the abstracts will represent 20% of the final mark.

Attendance to practical classes is mandatory. Students that do not attend two or more practical classes will have to pass an examination on the content of the practical classes.



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CONTENTS: THEORY (1/2)

The theory programme consists of the following topics:

Topic 1.- General characteristics of vegetable plant breeding

- 1.- Economic importance of vegetable crops
- 2.- Specific characteristics of vegetable crops

Topic 2. The tomato: taxonomy, domestication and spreading.

- 1.- Economic importance of the tomato
- 2.- Taxonomy. Wild relatives
- 3.- Crossability between the species of the genus *Lycopersicon*
- 4.- Exploitation of the wild relatives in tomato breeding
- 5.- Domestication of the tomato. Consequences.
- 6.- Difusion.
- 7.- Plant genetic resources of tomato and wild relatives

Topic 3. General characteristics of the current cultivars. Breeding objectives.

- 1.- General characteristics of tomato cultivars
 - 1.1. Great diversity of types
 - 1.2. Short life
 - 1.3. Hybrid varieties
 - 1.4. Accumulation of many genes of resistance to pathogens
 - 1.5. Good appearance and quality
 - 1.6. Adaptation to the chain production-consumption
- 2.- Needs and objectives for processing tomato breeding
- 3.- Needs and objectives for fresh consumption tomato breeding

Topic 4.- Breeding for specific traits

- 1.- Breeding for organoleptic and nutritive quality
- 2.- Breeding for resistance to diseases
 - 2.1.- Diseases causing great economic losses in tomato. Their control by the development of resistant cultivars
 - 2.2.- Resistance genes introgressed from wild relatives into tomato cultivars
- 2.3. Pathogen-derived resistance
- 2.4. Strategies for the development of transgenic plants resistant to fungus, bacteria and virus

Topic 5.- Applications of molecular markers to tomato breeding

- 1.- Definition and types of markers
- 2.- Application of molecular markers to vegetable breeding
 - 2.1. Development of high density genetic maps
 - 2.2. Marker-assisted selection
 - 2.3. Positional cloning
 - 2.4. Varietal identification
 - 2.5. Study of genetic variability in populations
 - 2.6. Application to tissue culture

Topic 6.- Applications of genomics to vegetable plant breeding

- 1.- Introduction
- 2.- Structural genomics. Gene sequencing strategies
- 3.- Applications of structural genomics
- 4.- Functional genomics
 - 4.1. Identification of the ORFs: gene annotation.
 - 4.2. Characterization of the function of the ORFs
- 5.- Applications of functional genomics
- 6.- Comparative genomics
- 7.- Applications of comparative genomics



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COURSE TITLE: VEGETABLE PLANT BREEDING

CONTENTS: THEORY (2/2)

Topic 7.- Pepper: taxonomy, varietal types.

- 1.- Economic importance
- 2.- Cultivated and wild species. Crossability between the species of the genus *Capsicum*
- 3.- Origin, geographic distribution and diffusion
- 4.- Genetic resources of pepper and wild relatives.
- 5.- Varietal types

Topic 8.- Breeding for agronomic characters

- 1.- Breeding requirements according to specific uses.
- 2.- Determination of allogamy percentages. Obtention of hybrid seed
- 3.- Breeding methods used
- 4.- Genetic control of the characteristics of interest
- 5.- Breeding for powder pepper

Topic 9.- Breeding for resistance to diseases

- 1.- Diseases causing great economic losses in pepper. Resistance sources used.
- 2.- Genes of resistance to diseases caused by bacteria. Their utilization in breeding.
- 3.- Genes of resistance to diseases caused by fungus. Their utilization in breeding.
- 4.- Genes of resistance to diseases caused by virus. Their utilization in breeding.

Topic 10.- Melon: taxonomy, varietal types

- 1.- Economic importance of melon
- 2.- Taxonomy and wild relatives
- 3.- Crossability between the species of the genus *Cucumis*
- 4.- Geographic distribution of the species of the genus *Capsicum*
- 5.- Origin and diffusion
- 6.- Genetic resources of melon and relatives

Topic 11.- Breeding of melon

- 1.- Varietal types cultivated in Spain
- 2.- Breeding methods according to the specific type of melon
- 3.- Specific difficulties in melon breeding
- 4.- Breeding for resistance to diseases

Topic 12.- Brassicas: taxonomy and varietal types

- 1.- Taxonomy of the genus *Brassica*
- 2.- The most important species of the genus *Brassica*. Evolutionary relations between cultivates species. Uses
- 3.- Cultivated botanic varieties
- 4.- Origin of the cultivated species. Domestication.

Topic 13.- Objectives and breeding methods in Brassicas

- 1.- Selfincompatibility systems in Brassicas
- 2.- Androesterility and its use in breeding
- 3.- Objectives and breeding methods in vegetable Brassicas
- 4.- Objectives and breeding methods in oilseed Brassicas



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COURSE TITLE: VEGETABLE PLANT BREEDING

CONTENTS: PRACTICE

- Practice 1.- Characterization of wild relatives of the genus *Lycopersicon*. Determination of discriminatory characters (1 session: 0.15 credits)
- Practice 2.- Determination of prezygotic and postzygotic incompatibility barriers. Staining of pollen tubes in the style. (1 session: 0.15 credits)
- Practice 3.- Utilization of molecular markers in the study of the variability in populations (2 sessions: 0.30 credits)
- Practice 4.- Internet resources for plant breeding (1 session: 0.15 credits)
- Practice 5.- Applications of the molecular markers to vegetable plant breeding (1 session: 0.15 credits)
- Practice 6.- Applications of Genomics to vegetable plant breeding (1 session: 0.15 credits)
- Practice 7.- Bioinformatics (1 session: 0.15 credits)
- Practice 8.- Genetic transformation in tomato (2 sessions: 0.30 credits)
- Practice 9.- Breeding for resistance to diseases (1 session: 0.15 credits)
- Practice 10.- Breeding of melon: practical cases (1 session: 0.15 credits)
- Practice 11.- Visit to a Seed Company or Research Centre (0,45 credits)



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RECOMMENDED BIBLIOGRAPHY

Books of Plant Breeding:

Hayward, M.; Romagosa, I.; Bosemark, N.O. 1993. Plant Breeding. Principles and prospects. Chapman & Hall. London.

Specific bibliography:

Atherton, J.G.; Rudich, J. 1986. The Tomato Crop. Chapman & Hall. London.

Kaloo, G.; Bergh, B.O. 1993. Genetic Improvement of Vegetable Crops. Pergamon Press.

McCreight, J.D.; Nerson, H.; Grumet, R. 1993. Melon *Cucumis melo* L. In: "Kaloo G.; Bergh, B.O. (Eds.). Genetic Improvement of Vegetable Crops. Pergamon Press." pp: 267-294.

Gómez-Campos, C. (Ed). 1999. Biology of Brassica Coenospecies. Elsevier. Amsterdam. The Netherlands.

Yoder, J. 1993. Molecular biology of tomato. Tahnomic Publishing Company. Lancaster, P.A. U.S.A.

Nuez, F.; Carrillo, J.M: (Eds.) Los marcadores genéticos en la Mejora Vegetal. Universidad Politécnica.

Henry, R.J. 2001. Plant genotyping. CABI Publishing. Oxon.

Nuez, F., Carrillo, J.M.; Lozano, R. (Eds.) 2001. Genómica y Mejora Vegetal. SECH, SEG, Junta de Andalucía.

Brown, T.A. 2002. Genomes 2. Bios Scientific Publishers. New York.

Gibson, G.; Muse, S.V. 2002. A primer of Genome Science. Sinauer Associates, Inc. Publishers. Massachusetts.

Nuez, F.; Gil, R.; Costa, J. 1996. El cultivo de pimientos, chiles y ajíes. Mundi-Prensa.

Joshi, S.; Berke, T. 2004, Perspectives of Bell Pepper Breeding. In: "Singh, P.K.; Dasgupta, S.K.; Tripathi, S.K. (Eds.) Journal of New Seeds. Volume 6, Numbers 2/3." pp: 51-74.