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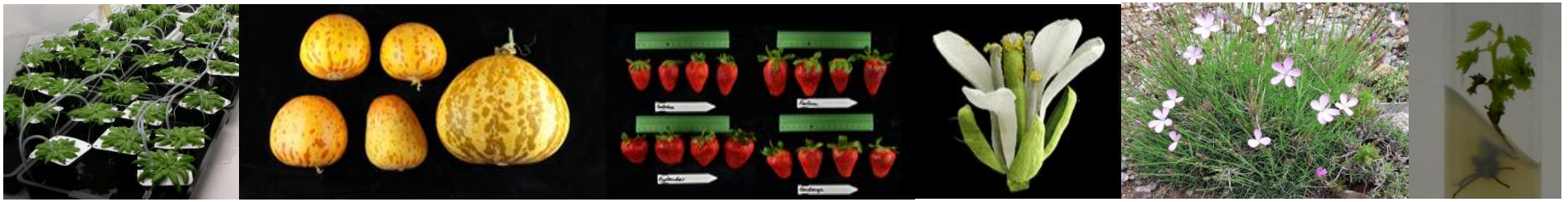
CRAG CENTRE FOR RESEARCH IN AGRICULTURAL GENOMICS

Master in Plant Biology, Genomics, and Biotechnology

Official Interuniversity Master

UAB (coordinator)

February 2023



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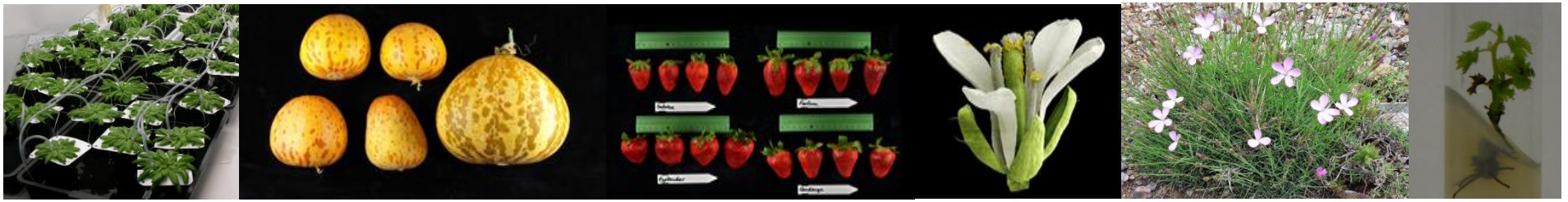
Characteristics of the master

- ✓ 60 credits
- ✓ Teaching modality: 100% face-to-face
- ✓ Interdisciplinary field of knowledge
- ✓ There are no mentions or specialties
- ✓ Teaching language: English
- ✓ Teaching center: Faculty of Biosciences, UAB
- ✓ Total number of places: 25



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Programme

1st Semester				2nd Semester			
Subject	**ECTS**	**To study**	**Type**	**Subject**	**ECTS**	**To study**	**Type**
Plant Physiology and Metabolism	6	6	OT	Plant Growth and Development	6	6	OT
Plant Molecular Biology	6		OT	Plant Systems Biology	6		OT
Plant Genomics	6	6	OB	External Practices	12	12	OB
Agricultural Biotechnology	6	6	OB	Final Master's Project	12	12	TFM
Computational Biology and Data Analysis	6	6	OB				
Plant-Environment Interactions	6	6	OB				
	Total	**30**			**Total**	**30**	

OB: Compulsory
OT: Optional

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Examples of Final Master's Thesis research lines

BOTANY

- Systematics, biodiversity and evolution of phanerogams
- Systematics and taxonomy of symbiotic fungi

PLANT MOLECULAR GENETICS

- Plant genomics and biotechnology
- Plant metabolism and metabolic engineering
- Plant responses to biotic and environmental stress
- Signal transduction and plant development

GENOMICS

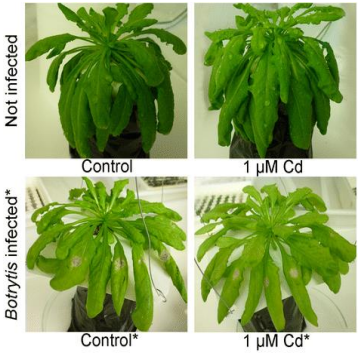
- Genetics and genomics of vegetable crops
- Rosaceae genetics and genomics
- Statistical and population genomics
- Structure and evolution of plant genomes

PLANT PATHOLOGY

- Fungal pathogens of woody plants
- Edible mycorrhizal fungi of forest trees

PLANT PHYSIOLOGY

- Plant stress physiology
- Plant-Soil interactions
- Natural adaptation



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Examples of master's thesis topics

- Transposable Elements as main players of crop plant genome evolution.
- The role of the vacuolar protein Sorting 41 in resistance to cucumber mosaic virus.
- Edition of rice genomes to enhance plant resistance against rice blast using CRISPR/Cas9
- Plant responses to high-light stress.
- Genomic, proteomic and genetic analyses of the *Arabidopsis* flower development gene regulatory network.
- Establishing initial connections between lignin genes and circadian clock in maize.
- Mechanism of natural adaptation to salinity in wild Brassicaceae.
- Salt stress interaction with flowering in *A. thaliana*: a role of JA, NO and ABA signaling?
- Study of signaling by measuring ionic fluxes and membrane potential in plant roots under salinity and carbonate stress.
- The effect of plant-growth promoting bacteria on *Arabidopsis thaliana.*
- Utility of *Spirulina* genus in the usage of wastewater from the food industry.
- Use of plant extracts in ecological vineyard management.

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CRAG CENTRE FOR RESEARCH IN AGRICULTURAL GENOMICS

- **Erasmus Internships**
  - Germany, Holland, France
- **Internships in industries**
  - Semillas Fitó, Vytrus Biotech, Grup Roig, Futureco-Bioscience S.A., INCAVI, Vitae Natural Nutrition, Amorós Nature, Bioo S.L., Leitat ...
- **Others**
  - to agree with the student

vytrus biotech

SEMILLAS fitó

amorós nature technology

LEITAT Technological Center member of TECNIO managing your technologies

FUTURECO bioscience

URBAN CROP SOLUTIONS

Grup Roig

Bioo

IRTA RECERCA I TECNOLOGIA AGROALIMENTÀRIES

INCAVI Institut Català de la Vinya i el Vi

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Webs of interest

- https://www.uab.cat/web/estudiar/official-master-s-degrees/admission/notice-of-admission/-1345655940214.html?param1=1345875358006
- http://www.cragenomica.es/es
- http://www.semillasfito.com/
- https://www.vytrus.com/
- https://www.futurecobioscience.com/en/
- http://incavi.gencat.cat/ca/recerca-desenvolupament/
- http://www.irta.cat/es-es/RIT/Centres/paginas/Cabrils.aspx
- http://www.uab.cat/web/treball-campus-1248934939395.html
- https://www.biootech.com/

Schedule model (old master)

FIRST SEMESTER — **COURS 2022/23**

HOLIDAY
EXAM
AC: Campus activity 13-15h

Clasroom C3b/002
CB/004
CB/013

T	Theoretical lessons
PAUL	Classroom practices
S	Seminars
PAI	Computer lessons
LAB	Lab lessons
VEXT	External visit

Code	Modules	Tipology	Credits
43864	**PMB** - Plant Molecular Biology	OB	6
43866	**AB** - Agricultural Biotechnology	OB	6
43863	**PPM** - Plant Physiology and Metabolism	OB	6
43865	**PG** - Plant Genomics	OB	6
43872	**PBL**- Problem Base Learning	OT	6
43868	**PD** - Plant Develop. and Environment Responses	OT	6

Week 4	3-oct	4-oct	5-oct	6-oct	7-oct
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11					
11-12					
12-13			FESTA MAJOR UAB		
13-14					
CLASS					
15-16					
16-17					
17-18					
18-19					
CLASS					

Week 5	10-oct.	11-oct.	12-oct.	13-oct.	14-oct.
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10				PPM T1	
10-11		Opening session PPM S1+S2 (G1+G2)		PPM T2	PPM T3
11-12				PPM S3 + S4 (G1+G2)	PPM T4
12-13					PPM T5
13-14			HOLIDAY		
CLASS		Sala Graus UAB		C3b/002	C3b/002
15-16					
16-17					
17-18					
18-19					
CLASS					

Week 6	17-oct	18-oct	19-oct	20-oct	21-oct
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11	PPMT6	PPMT9	PPM T11	PPM S5 G1	PPM S6 G1
11-12	PPMT7	PPMT10	PPM T12	PPM T13	PPM T15
12-13	PPMT8			PPM T14	PPM T16
13-14				PPM S5 G2	PPM S6 G2
CLASS	C3b/002				
15-16					
16-17					
17-18					
18-19					
CLASS					

Week 7	24-oct.	25-oct	26-oct	27-oct	28-oct
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11	PPM S7 G1	PPM S8 G1	PAUL RT G1, G2, G3	LAB2 G1 BG	FMT
11-12	PPM T17				
12-13	PPM T18	PPM S8 G2			
13-14	PPM S7 G2				
CLASS	C3b/002			C2/-151	Sala Graus
15-16				LAB3 G3 IC	
16-17					
17-18					
18-19					
CLASS				C2/-151	

Week 8	31-oct.	1-nov.	2-nov.	3-nov.	4-nov.
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11					
11-12			LAB2 G2 BG	LAB3 G1 IC	LAB3 G2 IC
12-13					
13-14		HOLIDAY ALL SAINTS DAY			
CLASS			C2/-151		
15-16			LAB2 G3 BG	PPM Visit Torre Marimon provisional date	
16-17					
17-18					
18-19					
CLASS			C2/-151		

Week 9	7-nov	8-nov	9-nov	10-nov	11-nov
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10				T6 PMB	
10-11	PPM S9+S10 (G1+G2) Exam	T1 PMB	T3 PMB	T7 PMB	T10 PMB
11-12		T2 PMB	T4 PMB	T8 PMB	T11 PMB
12-13	PBL T1		T5 PMB	T9 PMB	T12 PMB
13-14	PBL T2		St. Albert		
CLASS	C3b/002				
15-16	AC				
16-17					
17-18					
18-19					
CLASS					

Week 10	14-nov	15-nov	16-nov	17-nov	18-nov
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11	T13 PMB	T16 PMB	PMB PAI 1-4 INF BioCC	PG T1,T2	PG T3,T4,T5
11-12	T14 PMB	T 17 PMB			
12-13	T15 PMB	T 18 PMB			
13-14					
CLASS	C3b/002		UAB- PC1A	C3b/002	
14-15					
15-16			PMB PAI 5-6 INF BioCC		
16-17					
17-18					
CLASS			UAB- PC1A		

Week 11	21-nov.	22-nov.	23-nov.	24-nov.	25-nov.
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11	PG T6 -T7	PG PAI 1-4 INF BioCC	PG PAI 5-8 INF BioCC	PG T16-T17	PG PAUL 4h
11-12	PG T8 -T9			PG PAI 9-10 INF BioCC	
12-13					
13-14					
CLASS	C3b/002	UAB- PC5	UAB- PC5	C3b/002 UAB-PC5	C3b/002
14-15					PD S1
15-16	PG T10 -T11	PG T12 -T13	PG T14 - T15		PD S2
16-17					PD PLAB1 G1+G2
17-18					
CLASS	C3b/002	C3/012	C3b/002		C2/-151

Week 12	28-nov	29-nov	30-nov	1-des	2-des
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11	PAUL 1 PMB	PMB S1 G1 & G2	PMB S5 G1		
11-12	PAUL 2 PMB	PMB S2 G1 & G2	PMB S5 G2		Exam Plant Genomics
12-13	PAUL 3 PMB				
13-14					
CLASS	C3b/002				
14-15	PG VTEX CNAG provisional date	PMB S3 G1 & G2	PMB S6 G1		
15-16		PMB S4 G1 & G2	PMB S6 G2		
16-17					
17-18					
CLASS		C3/012			

Schedule model (old master)

FIRST SEMESTER — **COURS 2022/23**

HOLIDAY
EXAM
AC: Campus activity 13-15h

Clasroom C3b/002
CB/004
CB/013

T	Theoretical lessons
PAUL	Classroom practices
S	Seminars
PAI	Computer lessons
LAB	Lab lessons
VEXT	External visit

Code	Modules	Tipology	Credits
43864	**PMB** - Plant Molecular Biology	OB	6
43866	**AB** - Agricultural Biotechnology	OB	6
43863	**PPM** - Plant Physiology and Metabolism	OB	6
43865	**PG** - Plant Genomics	OB	6
43872	**PBL**- Problem Base Learning	OT	6
43868	**PD** - Plant Develop. and Environment Responses	OT	6

Week 4	3-oct	4-oct	5-oct	6-oct	7-oct
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11					
11-12					
12-13			FESTA MAJOR UAB		
13-14					
CLASS					
15-16					
16-17					
17-18					
18-19					
CLASS					

Week 5	10-oct.	11-oct.	12-oct.	13-oct.	14-oct.
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10				PPM T1	
10-11		Opening session PPM S1+S2 (G1+G2)		PPM T2	PPM T3
11-12				PPM S3 + S4 (G1+G2)	PPM T4
12-13					PPM T5
13-14					
CLASS		Sala Graus UAB		C3b/002	C3b/002
15-16					
16-17					
17-18					
18-19					
CLASS					

Week 6	17-oct	18-oct	19-oct	20-oct	21-oct
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11	PPMT6	PPMT9	PPM T11	PPM S5 G1	PPM S6 G1
11-12	PPMT7	PPMT10	PPM T12	PPM T13	PPM T15
12-13	PPMT8			PPM T14	PPM T16
13-14				PPM S5 G2	PPM S6 G2
CLASS	C3b/002				
15-16					
16-17					
17-18					
18-19					
CLASS					

Week 7	24-oct.	25-oct	26-oct	27-oct	28-oct
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11	PPM S7 G1	PPM S8 G1	PAUL RT G1, G2, G3	LAB2 G1 BG	FMT
11-12	PPM T17				
12-13	PPM T18	PPM S8 G2			
13-14	PPM S7 G2				
CLASS	C3b/002			C2/-151	Sala Graus
15-16				LAB3 G3 IC	
16-17					
17-18					
18-19					
CLASS				C2/-151	

Week 8	31-oct.	1-nov.	2-nov.	3-nov.	4-nov.
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11		HOLIDAY ALL SAINTS DAY	LAB2 G2 BG	LAB3 G1 IC	LAB3 G2 IC
11-12					
12-13					
13-14					
CLASS			C2/-151		
15-16			LAB2 G3 BG	PPM Visit Torre Marimon provisional date	
16-17					
17-18					
18-19					
CLASS			C2/-151		

Week 9	7-nov	8-nov	9-nov	10-nov	11-nov
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10				T6 PMB	
10-11	PPM S9+S10 (G1+G2) Exam	T1 PMB	T3 PMB	T7 PMB	T10 PMB
11-12		T2 PMB	T4 PMB	T8 PMB	T11 PMB
12-13	PBL T1		T5 PMB	T9 PMB	T12 PMB
13-14	PBL T2		St. Albert		
CLASS	C3b/002				
15-16	AC				
16-17					
17-18					
18-19					
CLASS					

Week 10	14-nov	15-nov	16-nov	17-nov	18-nov
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11	T13 PMB	T16 PMB	PMB PAI 1-4 INF BioCC	PG T1,T2	PG T3,T4,T5
11-12	T14 PMB	T 17 PMB			
12-13	T15 PMB	T 18 PMB			
13-14					
CLASS	C3b/002		UAB- PC1A	C3b/002	
14-15					
15-16			PMB PAI 5-6 INF BioCC		
16-17					
17-18					
CLASS			UAB- PC1A		

Week 11	21-nov.	22-nov.	23-nov.	24-nov.	25-nov.
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11	PG T6 -T7	PG PAI 1-4 INF BioCC	PG PAI 5-8 INF BioCC	PG T16-T17	PG PAUL 4h
11-12	PG T8 -T9			PG PAI 9-10 INF BioCC	
12-13					
13-14					
CLASS	C3b/002	UAB- PC5	UAB- PC5	C3b/002 UAB-PC5	C3b/002
14-15	PG T10 -T11	PG T12 -T13	PG T14 - T15		PD S1
15-16					PD S2
16-17					PD PLAB1 G1+G2
17-18					
CLASS	C3b/002	C3/012	C3b/002		C2/-151

Week 12	28-nov	29-nov	30-nov	1-des	2-des
h	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11	PAUL 1 PMB	PMB S1 G1 & G2	PMB S5 G1		
11-12	PAUL 2 PMB	PMB S2 G1 & G2	PMB S5 G2		Exam Plant Genomics
12-13	PAUL 3 PMB				
13-14					
CLASS	C3b/002				
14-15	PG VTEX CNAG provisional date	PMB S3 G1 & G2	PMB S6 G1		
15-16		PMB S4 G1 & G2	PMB S6 G2		
16-17					
17-18					
CLASS		C3/012			

Schedule model (old master)

SECOND SEMESTER

HOLIDAY
EXAM
AC: Campus activity 13-15h

T	Theoretical lessons
PAUL	Classroom practices
S	Seminars
PAI	Computer lessons
LAB	Lab lessons
VEXT	External visit

Code	Modules	Tipu	Credits
43869	**EP** - External Practicum	**OB**	**9**
43870	**FMT** - Final Master Dissertation Delivery	**OB**	**15**
43867	**PSB** - Plant system Biology	**OT**	**6**
43871	**NPBV** - New Perspectives in Plant Biology	**OT**	**6**

Week 1	**6-febr**		**7-febr**		**8-febr**		**9-febr**		**10-febr**
h	**Monday**		**Tuesday**		**Wednesday**		**Thursday**		**Friday**
9-10									
10-11	NPBV T1-3 LG	PSB T 7-9	NPBV T4-6 LG	PSB T 10-12	NPBV T7-9 LG	PSB PAUL 1-3	NPBV T10-12 LG	PSB PAUL 4-6	
11-12									
12-13									
13-14	NPBV S1 SM		AC						
AULA	CB/004	CB/013	CB/004	CB/013	CB/004	CB/013	CB/004	CB/013	
15-16			NPBV S2				NPBV S3		
16-17	NPBV S1 SM								
17-18									
AULA	**CB/004**		**CB/004**				**CB/004**		

Week 2	**13-feb.**		**14-feb.**		**15-feb.**		**16-feb.**		**17-feb.**	
h	**Monday**		**Tuesday**		**Wednesday**		**Thursday**		**Friday**	
9-10										
10-11	NPBV T13-14 SM	PSB PAUL 7-9	NPBV T15-16 SM	PSB PAUL 10-12	NPBV T17-18 EB	PSB PAUL 13-15	NPBV T19-20 SB	PSB PAUL 16-18	NPBV PLAB LG	PSB PAUL 19-21
11-12										
12-13										
13-14										
AULA	CB/004	CB/013	CB/004	CB/013	CB/004	CB/013	UAB-PC	CB/013	CB/004	CB/013
15-16										
16-17	NPBV S4 SM		NPBV S5		NPBV S6 SM					
17-18										
AULA	**CB/004**		**CB/004**		**CB/004**					

Week 20	**10-jul.**	**11-jul.**	**12-jul.**	**13-jul.**	**14-jul.**
h	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
9-10					
10-11		**FMT dissertation**	**FMT dissertation**	**FMT dissertation**	
11-12					
12-13					
13-14	**Exact Defense Dates will be announced around June**				

	11-sep	**12-sep**	**13-sep**	**14-sep**	**15-sep**
h	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
9-10					
10-11		**FMT dissertation**	**FMT dissertation**	**FMT dissertation**	
11-12					
12-13					
13-14	**Exact Defense Dates will be announced around July**				

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Career Prospects

Academic careers

- Most of the master students continue to PhD studies at UAB.

Base program for

PhD in PLANT BIOLOGY and BIOTECHNOLOGY

Acreditació EXCEL·LENT 5600161-71287-19

AQU Catalunya està inscrita a EQAR

- Research at Universities or Institutes

Non-academic careers

- I+D industry in agronomy, biotech, pharma, food and bioenergetics
- Plant genetic improvement
- Conservation of diversity (germplasm banks, seed banks, botanical gardens)

Selection criteria

In the event that the number of registrants exceeds the number of places offered, the allocation of places will be made according to the following priority criteria:

- Academic record (max. 3 points)
- CV indicating professional/research experience related to the field of the master's degree (max. 1.5 point)
- English language accreditation at a level higher than B1 (max. 0.5 points)
- Motivation letter (max. 1 point)

Maximum overall score: 6 points

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Documents for admission

The following documentation, which is mandatory, must be collected and scanned to be linked to the pre-registration application:

1. Academic record of higher education with the details of the subjects studied, ECTS (or hours), calls for applications, grades by subject and the overall grade (average grade of the academic record in scale of 0 - 10).
2. Title associated to the academic file presented in the previous document (if you do not have it, you can send it to us later).
3. CV with justification of merit that includes: research experience, publications, professional experience, stays abroad, scholarships and research grants (if applicable).
4. English language accreditation.
5. Motivation letter.

Admission and enrolment calendar (online)

• Pre-registration application: From 13 January to 31 May (both included).

• Expected date of resolution: From 13 June. Students will be notified during the following week.

• Pre-enrolment payment date: "Admitted" and "Conditionally Admitted" students must pay the pre-enrolment fee before **20th June** to guarantee their place.

• **Remember**: If you do not pay the pre-enrolment fee before the indicated date, your application will be placed on the "Waiting List".

• The days scheduled for the self-enrolment are **12, 13 and 14** July

• Once admitted, before officially enrolling in the course, you need to take a tutorial session with the coordinator of the master's degree.

Plant Physiology and Metabolism

GOAL

This module is conceived as a specific levelling course for those students who do not have a background in this subject.

BRIEF DESCRIPTION OF CONTENTS

- Introduction to Plant Physiology
- Cell compartmentalization spaces.
- Transport levels in the plant and its regulation,
- Primary metabolism.
- Richness and diversity of secondary metabolism.
- Regulation and integration of metabolism in plants.
- Industrial biotechnological uses of the products of secondary metabolism.
- Experimental techniques in Plant Physiology and Metabolism:
- Techniques for the study of transport in the plant.

Plant Molecular Biology

GOAL

- This module is as the one before conceived as a specific leveling course for those students who do not have a background in this subject.
- The student will receive the concepts of organization and structure of plant genes and how their expression is regulated. The different methodologies and tools currently used in biology and plant molecular engineering will be explained with a focus on those tools that facilitate the study of gene function and expression.
- Emphasis is placed on genetic transformation techniques in plants:

  cisgenesis vs transgenesis; legal aspects, the application of bioinformatics tools in the context of Molecular Biology and Plant Genetic Engineering.

Plant Genomics

GOAL

Provide a global and updated vision of the theoretical and technological bases related to the study of the organization, function and evolution of plant genomes and their possible applications to the genetic improvement of crop plants.

BRIEF DESCRIPTION OF CONTENTS

- Organization and function of plant genomes with special emphasis on the contributions in this area by women.
- Genome sequencing and annotation strategies.
- Gene function analysis strategies.
- Theoretical foundations of the main “omics” techniques used in plant genomics (transcriptomics, proteomics and metabolomics). Other omics.
- Molecular evolution of plants.
- Bioinformatics tools applied to genomic studies.

Agricultural Biotechnology

GOAL

- To introduce students to the fundamentals of Agricultural Biotechnology, a term of which all aspects related to molecular breeding (molecular breeding) are a substantial part.

BRIEF DESCRIPTION OF CONTENTS:

- Applications of genetically modified or edited plants in Agriculture. Micropropagation and in vitro culture in agriculture.
- Fundamentals of plant genetic improvement.
- Molecular improvement (Molecular breeding).
- Molecular diagnosis

Plant-environament Interactions

GOALS

- To understand how different environmental stressors affect plants
- To know the wide range of responses that these adverse conditions trigger in plants and that are conditioned by the duration, severity and speed at which it is imposed a stress, as well as by the combined action of several of them. Furthermore, resistance and sensitivity to stress vary by species, genotype, stage of development, and type of organ or tissue.

BRIEF DESCRIPTION OF CONTENTS:

- Abiotic stress
  - Salinity and drought
  - Ionic stress
  - Flooding
  - Temperature
- Biotic interactions
  - Pathogenic and Beneficial microorganisms
- Biotic and abiotic Stress Interactions

Computational Biology and Data Analysis

GOAL

- To understand novel molecular mechanisms from large data sets, today's researchers must be trained in quantitative sciences. The goal of this module is to introduce a reduced set of fundamental concepts for exploring, analyzing, visualizing, and understanding such data sets.

BRIEF DESCRIPTION OF CONTENTS:

- Introduction to R Programming with Tidyverse
- Biostatistics
- Data exploration
- Design principles and visualization theory
- Introduction to Systems Biology
- Genomic bioinformatics

Growth and Plant Development

GOAL

- To transmit the necessary knowledge to understand the main processes of development in the life of plants, at the molecular, cellular and organism level, and how these processes are organized and coordinated. Special emphasis will be placed on the influence of light on the growth and development of the plant.

BRIEF DESCRIPTION OF CONTENTS:

- General concepts
- Gametogenesis and embryogenesis.
- Seed development and dormancy.
- Vegetative development.
- Reproductive development.
- Light influence
- Photoperiod

Plant Systems Biology

CONTENT

- Systems Biology: concepts, study methodology and study of practical cases through multiple omics.
- Practical applications of the methods and techniques in Plant Genomics.
- Application of systems biology in the genetic improvement of crop plants.
- Examples of the use of molecular markers in improvement, variability, linkage. Importance of QTLs.
- Analysis and application of data derived from genome and transcriptomic sequencing.
- Analysis and application of data derived from proteomic studies in plants and protein interaction.
- Analysis and application of data derived from metabolomic studies.
- Integrated analysis of the biological problem applied to the improvement of crop plants.

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If you have questions

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Thanks for your attention!!!