Universitat de les Illes Balears

Teaching guide

Academic year	2012-13
Subject	10006 - Energy Dissipation Mechanisms in Plants
Group	Group 1, 2S
Teaching guide	A
Language	English

Subject identification

Subject	10006 - Energy Dissipation Mechanisms in Plants
Credits	2.4 in-class (60 hours) 2.6 distance (65 hours) 5 totals (125 hours).
Group	Group 1, 2S(Campus Extens)
Teaching period	2nd semester
Teaching language	Catalan

Lecturers

Lecturers	Timetable for student attention					
	Starting time	Finishing time	Day	Start date	Finish date	Office
Miquel Àngel Conesa Muñoz ma.conesa@uib.es	There are no defined sessions					
Jeroni Galmés Galmés jeroni.galmes@uib.es	There are no defined sessions					

Degrees where the subject is taught

Degree	Character	Academic year	Studies
Master's Degree in Plant Biology in Mediterranean Conditions	Optional		Postgraduate degree

Contextualisation

When plants are under stressing conditions, photosynthesis is impaired due to the lack of substrate (CO2) and frequently also water. However there is still sunlight energy unavoidably received by photosynthetic cells, producing electron transport through the photosystems. Since the indicated impairment, electrons cannot be used to Calvin cycle and thus, they can produce ROS damaging the photosynthetic apparatus and affecting the cell redox potential. Plants adapted to stressing conditions have mechanisms to partilly avoid such damage while acclimating to the stress; that is, mechanisms to dissipate energy.

The Mediterranean climate summer is a particularly stressing period, since the highest sunlight corresponds to higher drought stress. Since that, Mediterranean plant species, especially perennial ones, acquiered mechanisms to overcome summer conditions with a minimal oxidative damage.

This subject will deepen in the biochemical responses produced by the stress, and the mechanisms for primary avoiding and further acclimation to the stressing conditions.

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Some aspects regarding energy dissipation in under-irrigated crops will also be treated, and some applications of the biochemical substances produced by the plants to avoid damage will be discussed in terms of pharmaceutical and food research.

Requirements

Recommendable

Basic knowledge on general plant physiology and stress ecophysiology.

Skills

Specific

1. To understand the genetic, molecular and physiological mechanisms conditioning the water dependence of plants and the potential applications of such knowledge in irrigation management..

Generic

1. To deepen in the basic knowledge of plants (Botany and Ecophysiology) under Mediterranean conditions and the response to environmental factors (climate and soil)..

Content

Theme content

1-. Concept and causes of the oxidative stress

2-. Cell redox status

3-. Antioxidants: types and functions

4-. Responses of the antioxidants to the stress

5-. Interactions among antioxidants

6-. Mediterranean plants as a source of novel antioxidants

7-. Applications on crops and in pharmaceutical and food industry

Teaching methodology

In-class work activities

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Modality	Name	Typ.Gr.	Description
Theory classes		Large group (G)	To acquiere theoretical concepts to understant plant stress
Seminars and workshops	Instrumentation operation	Medium group (M)	To learn and practice some basic lab techniques related to antioxidant measurement
Seminars and workshops	Results screening and discussion	Medium group (M)	Results obtained from lab and field experiments will be shared and discussed, being a part of the evaluation of the subject.
Practical classes	Experimentation	Medium group 2 (X)	Plants will be measured outdoors, indoors or through lab experimentation

Distance education work activities

Modality	Name	Description
Group or individual self-study		Memory of practical classes and experimental design

Riscs especifics i mesures de protecció

Les activitats d'aprenentatge d'aquesta assignatura no comporten riscs específics per a la seguretat i salut de l'alumnat i, per tant, no cal adoptar mesures de protecció especials.

Workload estimate

Modality	Name	Hours	ECTS	%
In-class work activities		**60**	**2.4**	**48**
Theory classes		8	0.32	6.4
Seminars and workshops	Instrumentation operation	8	0.32	6.4
Seminars and workshops	Results screening and discussion	4	0.16	3.2
Practical classes	Experimentation	40	1.6	32
Distance education work activities		**65**	**2.6**	**52**
Group or individual self-study		65	2.6	52
	Total	**125**	**5**	**100**

At the beginning of the semester a schedule of the subject will be made available to students through the UIBdigital platform. The schedule shall at least include the dates when the continuing assessment tests will be conducted and the hand-in dates for the assignments. In addition, the lecturer shall inform students as to

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whether the subject work plan will be carried out through the schedule or through another way included in the Campus Extens platform.

Student learning assessment

Theory classes

Modality	Theory classes
Technique	Other methods **(Non-recoverable)**
Description	To acquiere theoretical concepts to understant plant stress
Assessment criteria	Final exam

Percentage of final qualification: 10% following path A

Instrumentation operation

Modality	Seminars and workshops
Technique	Other methods **(Non-recoverable)**
Description	To learn and practice some basic lab techniques related to antioxidant measurement
Assessment criteria	

Percentage of final qualification: 10% following path A

Results screening and discussion

Modality	Seminars and workshops
Technique	Student internship dissertation **(Non-recoverable)**
Description	Results obtained from lab and field experiments will be shared and discussed, being a part of the evaluation of the subject.
Assessment criteria	Memory

Percentage of final qualification: 20% following path A

Experimentation

Modality	Practical classes
Technique	Other methods **(Non-recoverable)**
Description	Plants will be measured outdoors, indoors or through lab experimentation
Assessment criteria	

Percentage of final qualification: 20% following path A

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Group or individual self-study

Modality	Group or individual self-study
Technique	Student internship dissertation **(Recoverable)**
Description	Memory of practical classes and experimental design
Assessment criteria	Memory

Percentage of final qualification: 40% following path A

Resources, bibliography and additional documentation

Basic bibliography

FLEXAS, J. et al. 2012 -Terrestrial Photosynthesis in a Changing Environment. A Molecular, Physiological and Ecological Approach. Cambridge University Press.
LAMBERS, H. Et al. 1998. Plant Physiological Ecology. Springer Verlag. N. York
SCHULZE, E.D. et al. 1995 - Ecophysiology of Photosynthesis. Springer Verlag.

Complementary bibliography

AZCÓN-BIETO, J., TALÓN M. 2000 - Fundamentos de Fisiología Vegetal. Mc Graw Hill Interamericana, Edicions UB. Madrid
DRAKE, B.G. et al. 1997 - More efficient plants: a consequence of rising atmospheric C02. Annual Rev.Plant Physiol.and Mol.Biol.vol.48
HALL, D.O. et al. 1993 - Photosynthesis and production in a changing environment. A field and a laboratory manual. Chapman and Hall
LARCHER W. 2003. –Physiological Plant Ecology 4th Ed. Springer
NOBEL, P.S. 1991 - Physicochemical and environmental Plant Physiology. Academic Press
ORT, D.R. et. al. 1996 - Oxygenic photosynthesis: the light reactions. Advances in photosynthesis. vol.4. Kluwer Academic Pub.
SCHULZE, E.D. et al. 1993 - Design and execution of experiments on C02 enrichment. Ecosystems research report nº 6. Commision of the European Communities.
TENHUNEN, J.D. et al.1987 - Plant response to stress. Springer-Verlag.
WALKER, B. et al. 1996 - Global change and terrestrial ecosystems. Inter.Geospere-Biosphere programme book series 2. Cambridge University Press

Other resources

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