



Subject	10007 - Respiration and Carbon Levels
Group	Group 1, 2S
Teaching guide	A
Language	English

Subject identification

Subject	10007 - Respiration and Carbon Levels
Credits	1.2 attended (30 Hours) 3.8 non-attended (95 Hours) 5 total (125 Hours).
Group	Group 1, 2S
Semester	
Teaching language	

Lecturers

Lecturers	Office hours for students					
	Start time	End time	Dia	Start date	End date	Despatx
Miquel Ribas Carbó mribas@uib.cat	There are no sessions set					

Degrees where the subject is taught

Degree	Character	Course	Studies
Master in Biology of Plants in Mediterranean Conditions	Optional		Postgraduate degree

Contextualisation

Plant respiration plays a significant role in carbon balance, as it consumes most of the carbon acquired during photosynthesis. Unlike photosynthesis, respiration is continuously present in all living cells.

Under optimal conditions, photosynthetic rates are significantly higher than respiration (5-30 fold). However, photosynthesis is much more sensitive to stress conditions than respiration. Consequently, under stress conditions, respiration has a much larger impact on the plant carbon balance.

Understanding the responses of respiration to water stress as well as the function of respiration under these conditions is critical when trying to predict and/or model the responses of plants to environmental changes.

Requirements

Previous knowledge of plant physiology will be useful.

It is recommendable to have followed the courses "Ecophysiology Techniques".

Skills



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Specific

1. Learning the background of plant respiration to water stress.
2. Understanding the concepts of plant respiration under water stress.
3. Comprehending the links between respiration, photosynthesis and plant growth..
4. Modelling the interactive responses of the cyanide-resistant respiration.

General

1. Comprehending the roles of respiration.
2. Learning the importance of respiration in plant carbon balance.

Content

Thematic content

Introduction. Introduction

What's respiration? Introduction to the concepts of plant respiration. Glycolysis, Krebs's cycle and mitochondrial electron transport. Where is respiration taking place?

Functions of respiration. Functions of respiration

What are the functions of respiration? 1. ATP production; 2. Interaction with photorespiration; 3. Metabolic interactions

Components of respiration. Components of respiration

Maintenance respiration and growth respiration.

Regulation of respiration at the whole plant level. Regulation of respiration at the whole plant level

Energy demand; Substrate availability; Temperature

Plant carbon balance. Plant carbon balance

Carbon Balance = Photosynthesis - Respiration

Understanding the significance of this equation at the different scales of time and space

Cyanide resistant respiration. Cyanide resistant respiration

Description of the cyanide-resistant alternative respiratory respiration.

Biochemical reactions of the alternative oxidase (AOX)

Known function of the AOX in plants.

Response of AOX to water stress

Measuring plant respiration. Measuring plant respiration

Technical details of respiratory measurements.

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Oxygen electrodes; gas-exchange; stable isotopes

Teaching methodology

Attended activities

Type	Name	G. type	Description
Theory classes	Lectures	Large group (G)	Presenting actual knowledge on the subjects of the course
Seminars and workshops	Paper Term	Medium group (M)	Discussing novel aspects /advances on the different subjects of the course. Discussion of previously selected read articles.
Assessment	Evaluation	Large group (G)	Written exam to evaluate the acquired knowledge

Non-attended activities

Type	Name	Description
Individual self-study		Studying the contents of the course
Individual self-study	Paper Term	Preparing an oral presentation of a manuscript summarizing the theoretical or technical issues related to the manuscript.
Group self-study	Debate	Discussion of the oral presentations presented regarding the manuscripts previously read by all students.

Workload estimate

Type	Name	Hours	ECTS	%
Attended activities		30	1.2	24
Theory classes	Lectures	24	0.96	19.2
Seminars and workshops	Paper Term	4	0.16	3.2
Assessment	Evaluation	2	0.08	1.6
Non-attended activities		95	3.8	76
Individual self-study		87	3.48	69.6
Individual self-study	Paper Term	6	0.24	4.8
Group self-study	Debate	2	0.08	1.6
Total		125	5	100



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At the beginning of the semester the subject schedule will be available to students through the UIBdigital platform. This schedule will at least include the dates for the continuous assessment exams and assignment deadlines. Furthermore, the lecturer will inform students as to whether the subject syllabus will be carried out according to the schedule or otherwise, including Campus Extens.

Student learning assessment

Paper Term

Type	Seminars and workshops
Technique	Papers and projects (Recoverable)
Description	Discussing novel aspects /advances on the different subjects of the course. Discussion of previously selected read articles.
Assessment criteria	Quality and clarity of oral presentation

Final mark percentage: 40% for pathway A

Evaluation

Type	Assessment
Technique	Short-answer tests (Recoverable)
Description	Written exam to evaluate the acquired knowledge
Assessment criteria	Responses of the questionnaire

Final mark percentage: 40% for pathway A

Debate

Type	Group self-study
Technique	Self-assessment systems (Non-recoverable)
Description	Discussion of the oral presentations presented regarding the manuscripts previously read by all students.
Assessment criteria	Interest and participation in the debates

Final mark percentage: 20% for pathway A

Resources, bibliography and additional documentation

Basic bibliography

Lambers H, Ribas-Carbo M (2005)
Plant Respiration: From Cell to Ecosystem.
Volume 18 of Advances in Photosynthesis and Respiration
Springer

Flexas, J. Galmes, J., Ribas-Carbó, M., Medrano, H. (2005). The effects of water stress on plant respiration. In Plant Respiration: From Cell to Ecosystem. Lambers H, Ribas-Carbo M, eds Chapter 6, pp 85-94





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Lambers H (1980) The physiological significance of cyanide-resistant respiration in higher-plants. *Plant Cell and Environment* 5: 293-302

Additional bibliography

Florez-Sarasa, I.; Bouma, T.; Medrano, H.; Azcon-Bieto, J.; Ribas-Carbó, M. (2007) Contribution of the cytochrome and alternative pathways to growth respiration and maintenance respiration in *Arabidopsis thaliana*. *Physiologia Plantarum* 129: 143-151

