Course Unit Descriptor

Study Programme: Master of Science in Biology

Course Unit Title: PLANT CELL REDOX HOMEOSTASIS

Course Unit Code:MB40

Name of Lecturer(s): Milan Borišev

Type and Level of Studies: Second (Master of Science)

Course Status (compulsory/elective): Elective

Semester (winter/summer): winter or summer

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): face to face

Number of ECTS Allocated: 7

Prerequisites: none

Course Objective: The primary objective of the course is the redox balance inside of the plant cell, influenced by reduction and oxidation processes in different cell compartments. Redox homeostasis has a key role in plant response to developmental and environmental stimuli. There are number of complementary cross talk pathways involved I redox cell hub.

Learning Outcomes:

Lectures will familiarize students with abiotic stressors and their influence to redox homeostasis, which is highlighted as one of the central regulators in the cell exposed to stress. Students will get familiar with methods of identifying stress markers in relation to this topic, and analyzing the most common indicators of plant cell redox status.

Syllabus:

Theory

Redox homeostasis as one of the main modulators of plant response to stress. Reactive oxygen species (ROS). Redox changes. Oxidative stress and the role of peroxisome. Redox balance in mitochondria. Redox balance in the chloroplast. Nitric oxide (NO). Interaction of NO and organic molecules. Interaction of ROS/NO and phytohormones. Ascorbate/glutathione cycle. ROS roles in signaling. Vacuole in redox homeostasis. Nonenzymatic processes in redox cell hub.

Practice

Seminar work, laboratory practice: Preparation of plant samples and extracts. Isolation of the chloroplast and mitochondria. Determination of reduced glutathione. Determination of oxidized glutathione. Determination of ascorbate. Determination of monodehydroascorbate. Measurement of pH in the vacuole. Activity of V ATPase. Enzyme kinetics in the ascorbate glutathione cycle. Protein analyses. Statistical analyses.

Required Reading: Gupta, D.K., Palma, J.M., Corpas, F.J. eds. (2016). Redox State as a Central Regulator of Plant-Cell Stress Responses. Springer International Publishing, Switzerland. str. 386. ISBN 978-3-319-44081-1

Gupta, D.K., Palma, J.M., Corpas, F.J. eds. (2015). Reactive Oxygen Species and Oxidative Damage in Plants Under Stress. Springer International Publishing, Switzerland. str. 370. ISBN 978-3-319-20421-5

Gupta, K.J., Igamberdiev, A.U., eds. (2015). Reactive Oxygen and Nitrogen Species Signaling and Communication in Plants. Springer International Publishing, Switzerland. str. 316. ISBN 978-3-319-10079-1

Hayat, S., Mori, M., Pichtel, J., Ahmad, A. eds. (2010). Nitric Oxide in Plant Physiology. WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany. str.210. ISBN: 978-3-527-32519-1

Weekly Contact Hours:2	**Lectures: 3**	**Practical work:** 4

Teaching Methods:

Lectures, discussion in student group work, laboratory work, seminar disscusion

Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	**Final exam**	points
Active class participation	3	written exam	50
Practical work	-	oral exam	-
Preliminary exam(s)	37	…….	
Seminar(s)	10		
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			