

Course name: Molecular Background of Crop Production

ECTS	3
Course status	complementary
Course final assessment /evaluation of outcomes	Exam
Prerequisite	Basic of molecular biology

Main field of study:

Educational profile	General-academic
Code of studies and education level	SI/SM (bachelor/master)
Semester of studies	Winter/summer
Language of instruction	English

Course offered by:

Name of faculty offering the course	Faculty of Agriculture and Economics
Name of department offering the course	Department of Plant Breeding, Physiology and Seed Science
Course coordinator	Dr hab. Barbara Jurczyk, prof. URK

Learning outcomes:

Symbol of outcome	Description of the learning outcome	Reference to main field of study outcomes	Area symbol*
KNOWLEDGE – student knows and understands			
MBCP_IE_W01	the molecular basis of physiological processes affecting crop yield		
MBCP_IE_W02	the relation between genes and phenotypic response to the environment		
MBCP_IE_W03	the way in which theory of plant molecular biology can help in practical agricultural problems		
SKILLS – student is able to			
MBCP_IE_U01	analyze gene expression on mRNA level		
MBCP_IE_U02	design primers for PCR reaction		
MBCP_IE_U03	collect, compile and interpret the experimental data		
SOCIAL COMPETENCIES – student is ready to:			
MBCP_IE_K01	work in a research group and perform a specific experiment		
MBCP_IE_K02	understand the importance of molecular background in agricultural activities		

Teaching contents

Lectures	15 hours
Topics	<ol style="list-style-type: none"> 1. Introduction: interactions between plant genome and environment in plant growth, development and evolution. 2. Basic mechanisms of gene expression regulation in plants. 3. Basic signal transduction pathways in plants. 4. Perception of the environmental signals in plant cells. 5. Photosynthetic redox signaling in plants and its role in a stress response. 6. Molecular mechanism of plant hormone signals. 7. Molecular regulation of vegetative/generative transition. 8. Molecular regulations of photosynthetic activity in the response to endogenous and environmental signals. 9. Molecular regulations of plant photosynthetic productivity, the role of agrotechnical factors.

	10. Cold acclimation and freezing tolerance – basic mechanism. 11. Cold acclimation and freezing tolerance – environmental effects and regulations of molecular response network. 12. Drought and waterlogging tolerance of crops.
Accomplished learning outcomes	
Means of verification, rules and criteria of assessment	Single-choice test (minimum 50% correct answers to pass the exam); the proportion of the lecture pass mark in the final mark is 50%.
Classes:	15 hours
Topics	Molecular response to abiotic stresses- profiling of the expression of some genes using Real Time PCR technique. <ol style="list-style-type: none"> 1. Experiment planning and set up, method description. 2. Designing primers for PCR reactions using NCBI nucleotide sequences. 3. mRNA extraction. Evaluation of RNA quantity and quality. 4. Reverse transcription. 5. PCR reaction and data analysis.

References:

Basic	Taiz L., Zaiger E. (eds.) "Plant Physiology" 6 th edition. Sinauer, Sunderland, ME. Ashraf M., Harris P.J.C "Abiotic stresses-Plant resistance through breeding and molecular approaches" 2005. FPP Press, New York.
Supplementary	B. Jurczyk et al. 2014. Assessment of candidate reference genes for the expression studies with brassinosteroids in <i>Lolium perenne</i> and <i>Triticum aestivum</i> . Journal of Plant Physiology, 171: 1541–1544 B. Jurczyk et al. 2015. Evidence for alternative splicing mechanisms in meadow fescue (<i>Festuca pratensis</i>) and perennial ryegrass (<i>Lolium perenne</i>) Rubisco activase gene. Journal of Plant Physiology, 176:61–64. Current publications provided during classes.

Structure of learning outcomes

Area of academic study:	3 ECTS
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Structure of student activity

Contact hours	37	hrs.	1,4 ECTS**
Including:			
lectures	15	hrs.	
classes and seminars	15	hrs.	
consultations	5	hrs.	
participation in research		hrs.	
obligatory traineeships		hrs.	
participation in examination	2	hrs.	
e-learning		hrs.	ECTS**
student own work	38	hrs.	1,6 ECTS**

*Areas of academic study in the fields of: H- humanities; S - social studies; P – biological sciences; T – technological sciences; M- medical, sport and health sciences; R – Agricultural, forestry and veterinary sciences; A – the arts

** stated with an accuracy to 0.1 ECTS, where 1 ECTS = 25 - 30 hours of classes