

Molecular Plant Physiology and Biochemistry of Plants and Associated Microbes					
Identification number	Workload	Credit points	Term of studying	Frequency of occurrence	Duration
MN-B-SM (P 1)	360 h	12 CP	1 <sup>st</sup> or 2 <sup>nd</sup> term of studying	each term, 2 <sup>nd</sup> half	7 weeks
<b>1</b>	<b>Type of lessons</b>		<b>Contact times</b>	<b>Self-study times</b>	<b>Intended group size*</b>
	a) Tutorials		22 h	33 h	max. 2
	b) Practical/Lab		161 h	117 h	max. 2
	c) Seminar		3 h	24 h	max. 2
<b>2</b>	<b>Aims of the module and acquired skills</b> Students who successfully completed this module ... <ul style="list-style-type: none"> <li>• have acquired detailed knowledge about methods used in plant DNA technology and protein biochemistry as well as knowledge of principles and methods used in molecular plant physiology.</li> <li>• are trained in the use of transgenic approaches and methods to functionally analyze gene products and their impact on plant growth, development, and biotic interactions (see contents of the module).</li> <li>• can independently carry out small scientific projects related to the topic of the module.</li> <li>• have learned how to present research results in oral and written form and to critically discuss scientific publications related to the topic of the module on a professional level.</li> <li>• are able to transfer skills acquired in this module to other fields of biology.</li> </ul>				
<b>3</b>	<b>Contents of the module</b> <ul style="list-style-type: none"> <li>• Identification and screening of T-DNA insertion lines (primer design, PCR, gDNA)</li> <li>• Generation of transgenic plants and fungi</li> <li>• Pathogenicity assays</li> <li>• Generation of RNAi or artificial micro-RNA constructs</li> <li>• Detection of reporter gene activity</li> <li>• Localization studies of transgenic products</li> <li>• Comparative characterization of mutant lines</li> <li>• Metabolite profiling</li> <li>• DNA-protein interaction studies</li> <li>• Protein-protein interaction studies (co-immunoprecipitation, yeast two hybrid, split YFP)</li> <li>• Nutrient transport studies</li> <li>• Production of recombinant protein in <i>E. coli</i></li> </ul> <p><i>Explanatory note:</i> The list above comprises state-of-the art biochemical and molecular methods with emphasis on DNA technologies and protein biochemistry that are commonly used in the field of molecular plant physiology. Every student participating in this module will be confronted with a large subset of it. The exact content, however, will depend on the 4.5-week research project the student will work on (lab of Prof. Dr. M. Bucher: plant-microbe interactions, transporters, and plant metabolism, lab of Prof. Dr. G. Döhlemann: plant immunity and microbial virulence, lab of Dr. T. Gigolashvili: regulation of glucosinolate biosynthesis, lab of Prof. Dr. U. Höcker: light signaling and developmental biology, lab of Prof. Dr. S. Kopriva: plant mineral nutrition, lab of Dr. S. Krüger: the P-serine pathway in plants).</p>				
<b>4</b>	<b>Teaching/Learning methods</b> <ul style="list-style-type: none"> <li>• Interactive tutorials; Practical/Lab (Project work); Seminar; Guidance to independent research; Training on presentation techniques in oral and written form</li> </ul>				

5	<p><b>Requirements for participation</b></p> <p>Enrollment in the Master's degree course "Biological Sciences" or in the Master's degree course "Biochemistry"</p> <p><b>Additionally recommended:</b> Successful participation in an advanced Molecular Plant Physiology and Biochemistry module during the Bachelor's degree course (e.g. MN-B-WP II [mPlant 1] for Cologne students) or similar skills (after consultation). In cases of doubt, please contact the module coordinator (see 10) before choosing this subject module.</p>
6	<p><b>Type of module examinations</b></p> <p>The final examination consists of three parts: Two hours written examination about topics of the tutorials and the practical/lab part (50 % of the total module mark), oral presentation (25 % of the total module mark) and seminar paper (25 % of the total module mark)</p>
7	<p><b>Requisites for the allocation of credits</b></p> <p>Regular and active participation; Each examination part at least "sufficient" (see appendix of the examination regulations for details)</p>
8	<p><b>Compatibility with other Curricula</b></p> <p>Biological subject module in the Master's degree course "Biochemistry"</p>
9	<p><b>Significance of the module mark for the overall grade</b></p> <p>In the Master's degree course "Biological Sciences": 15 % of the overall grade (see also appendix of the examination regulations)</p>
10	<p><b>Module coordinator</b></p> <p>Prof. Dr. Marcel Bucher, phone 470-2481, e-mail: m.bucher@uni-koeln.de</p>
11	<p><b>Additional information</b></p> <p><b>Subject module</b> of the Master's degree course "Biological Sciences", <b>Focus of research:</b> (P) Molecular Plant Sciences</p> <p><b>Participating faculty:</b> Prof. Dr. M. Bucher, Prof. Dr. G. Döhlemann, Dr. T. Gigolashvili, Prof. Dr. U. Höcker, Prof. Dr. S. Kopriva, Dr. S. Krüger</p> <p><b>Literature:</b></p> <ul style="list-style-type: none"> <li>• Heldt, H.-W., Piechulla, B. (2010) Plant Biochemistry. 4<sup>th</sup> edition, Academic Press</li> <li>• Buchanan, B.B., Gruissem, W., Jones, R.J. (2015) Biochemistry and Molecular Biology of Plants. 2<sup>nd</sup> edition, Wiley &amp; Sons</li> <li>• For those students, who speak German: Kapitel 5 (Stoffwechselfysiologie) aus Kadereit, J.W., Körner, C., Kost, B., Sonnewald, U. (2014) Strasburger - Lehrbuch der Botanik. 37. Auflage, Spektrum Akademischer Verlag</li> <li>• Further original papers will be handed out during the module.</li> </ul> <p><b>General time schedule:</b> Week 1-4 (Mon.-Fri.) and Week 5 (Mon.-Wed): Tutorials and practical/lab; Week 5 (Thu-Fri) and Week 6 (Mon.-Fri): Preparation for the seminar talk (held at the end of week 6) as well as writing seminar paper; Week 7 (Mon.-Fri): Preparation for the written examination</p> <p><b>Note:</b> The module contains hand-on laboratory work conducted individually and is taught in research laboratories. The module does not contain computer-based practicals/research as a main component.</p> <p><b>Introduction to the module:</b> May 25, 2020 at 9:00 a.m., Cologne Biocenter, room 4.003 (fourth floor). Additional Information on the currently most relevant topics of the module will be send to the participants via e-mail about one week before the practical work starts.</p> <p><b>Written examination:</b> July 17, 2020, second/supplementary examination August 28, 2020; the latter date may vary if students and module coordinator agree. More details will be given at the beginning of the module.</p>

\* The module is conceived for a total of up to 8 Students: 7 students from the Master's degree course "Biological Sciences" and 1 student from the Master's degree course "Biochemistry".