Georg-August-Universität Göttingen **Module M.Agr.0120: Molecular Diagnostic and Biotechnology in Crop Protection**	6 C 4 WLH

Learning outcome, core skills: Participants will be able to understand nucleic acid based as well as immunologic diagnostic tools for detection of plant pathogens and pests. More the ability to select appropriate diagnostic techniques and make informed decisions regarding their development and application is one of the core skills. Students shall understand the role of biotechnology in plant protection and resistance breeding to be able to assess the potentials and risks of GM crops and other GMOs in plant protection.	**Workload:** Attendance time: 65 h Self-study time: 115 h

Course: Molecular Diagnostic and Biotechnology in Crop Protection (Lecture) *Contents*: Principles and applications of diagnostic techniques in plant protection with a focus on nucleic acid analysis (characteristics as accuracy, detection level, multiplexing, quantification, portability, and designability). Nucleic acid detection: RT-PCR viruses, group specific primers, multiplex dsRNA-diagnosis (viruses), qPCR (SYBR, TaqMan, fluorophores), Nested-PCR, RFLP, MLSA, ddPCR (phytoplasma), Barcoding (fungi, insects, weeds) SNP-genotyping (KASP, etc.), RCA (DNA viruses, Padlock-probes), Hybridisation (dot-blot viruses, RNAscope, SABER-FISH), DNA-arrays (microarrays), HTS/NGS/ Transcriptomics (Virome/metagenomics analysis, discovery of new virus diseases), Sequencing platforms (Roche 454, Illumina, Solid and Ion Torrent, SMRT and MinION nanopore sequencing), Isothermal amplification techniques (LAMP, RPA, HAD, NASBA), CRISPR based diagnosis (viruses) Molecular detection of specific traits (fungicide, herbicide, insecticide resistance). Protein detection: ELISA, TPIA, LFA, Immune fluorescence, ISEM electron microscopy, confocal microscopy and fluorescent labelled viruses, Immuno(capture)-PCR, Luminex. Biotechnology in plant protection: Crop trait targets, techniques to increase genetic diversity, cisgenesis, NGS and third generation sequencing, omics, genetically modified organisms (GMOs) in engineering resistance to viruses, pests, herbicides, bacterial and fungal pathogens, genome editing tools, applications of RNA interference and epigenome modifications, RNAi machinery, cross-kingdom RNAi, VIGS, HIGS, SIGS, Epigenetics, regulation and public acceptance, risk assessment	4 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** Understanding concepts and technical principles of molecular diganostic methods and the applicatoin of molecular markers and plant biotechnology in plant protection. Demonstration of the ability to read primary literature that describes applications of techniques covered by the module	6 C

Admission requirements: none	**Recommended previous knowledge:** none

Language: English	**Person responsible for module:** Prof. Dr. Mark Varrelmann
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	