Biotechnology of Crop Protection

Obligatory module or Selective module	**Biotechnology of Crop Protection**	**PNH 4239**
Semester	Even semester	
Module level	Undergraduate	
Module Coordinator	Prof.Dr.Ir.Siti Subandiyah M.Agr.Sc	
Lecturer(s)	Prof.Dr.Ir.Siti Subandiyah M.Agr.Sc Alan Soffan S.P., M.Sc., Ph.D	
Type of Module	1 hour and 40 minutes lecture Practical	
Status	E (elective courses)	
Exam	Written	
Number of participants	40	
Credit Points:	2/1 (5.02 ECTS)	
Description:	This course was held to provide supplies to students of the Department of Plant Pests and Diseases related to three important concepts of using Biotechnology, namely 1. Molecular identification of plant-disturbing organisms (OPT) and diagnosis of damage due to pests using molecular techniques, 2. Interaction of host plants with pests at the molecular level 3. Management of pests based on molecular techniques This course is a continuation of the Agricultural Biotechnology course taken in the previous semester, with an emphasis on the theoretical and practical aspects of the field of plant protection. The theoretical aspects of the use of molecular techniques were presented in 13 meetings where the three important aspects of the use of biotechnology above were emphasized in two fields, namely the field of plant diseases including viruses, bacteria, fungi, nematodes, while the second field was emphasized on insect pests. Submission of the theoretical aspects of plant protection biotechnology is evaluated in two exams namely the midterm and the end of the semester. In addition to delivering theoretical aspects, the Biotechnology Course also emphasizes the practical aspects of providing skills using molecular techniques, such as DNA extraction with samples from symptomatic plants infected with plant diseases (viruses, bacteria, etc.) as well as from insect samples. DNA extraction is taught using either basic techniques such as CTAB or the use of an extraction kit. This extraction activity is continued until the sequence preparation stage. In addition to activities in the wet lab, participants will also be introduced to the use of some basic software when handling sequence data to the creation of a phylogeny tree and how to submit sequential data to GenBank. The total meetings for practicum activities range from 6-8 meetings.	

	The Plant Protection Biotechnology course will be given both conventionally (classically) and by combining the concepts of student centered learning (SCL) and Outcome Based Learning (OBL). In addition, this course will be designed and developed with the concept of MOOC (Massive Open Online Courses). Lectures are delivered in class through face-to-face and discussion. For enrichment of material students are given assignments independently in accordance with related material. Students are also given group assignments to make papers relevant to crop protection biotechnology by summarizing from various weighted journals. Through discussion students practice to think critically, analytically, and creatively.
Academic goal (competency):	a. Students are able to know the tools, tools and molecular techniques that are used in the development of biotechnology in the field of tanmaan protection (starting from DNA / RNA isolation-PCR-Next Generation Sequencing-bioinformatics). b. Students are able to know and are able to use software (online and offline) sequencing data processing (Nucleotides and Proteins) (eg NCBI, DDJB, Bioedit, Modeller, Protein structure, primary design etc.) c. Students are able to know and understand the concept of molecular pest identification (DNA Barcoding) and the concept of population genetic d. Students are able to explain the concepts and techniques of Molecular Detection and Identification of important diseases e. Students are able to explain the concept of Molecular Pathogenicity (survival, propagation and transmission outside the host, enzymes, toxins, hormones). f. Students are able to know the concepts of susceptibility and resistance of host plants when exposed to disease or pest attacks at the molecular level g. Students are able to understand and explain the latest Biotechnology for pest management (GMO, Gene Silencing, Gene editing etc) h. Students are able to understand and be able to explain the concept of Biosafety and Biosecurity in the field of plant protection biotechnology i. Students are able to know and be able to explain the Biotechnology Industry in Pest Management (GMO Crops, Industrial Products, etc.)
Course outcomes: CO1 = Students are able to understand and explain the concept of molecular identification of plant-disturbing organisms (OPT) and diagnosis of damage due to pests CO2 = Students are able to understand and explain the interaction of host plants with pests at the molecular level CO3 = Students are able to understand and can explain the management of pests based on molecular techniques.	

Contents:

- Introduction of molecular techniques used in the development of biotechnology science in the field of plant protection (starting from DNA / RNA isolation-PCR-Next Generation Sequencing-bioinformatics).
- Software (online and offline) sequencing data processing (Nucleotides and Proteins) (eg NCBI, DDJB, Bioedit, Modeller, Protein structure, primary design etc.)
- The concept of molecular pest identification (DNA Barcoding) and the concept of population genetic
- The concept and technique of detection and identification of molecular diseases in important plants.
- Molecular Pathogenicity (survival, propagation and transmission outside the host, enzymes, toxins, hormones)
- The concept of susceptibility and resistance of host plants when exposed to disease or pest attacks at the molecular level
- Latest biotechnology for pest management (GMO, Gene Silencing, Gene editing etc)
- Biosafety and Biosecurity in the field of plant protection biotechnology
- Biotechnology Industry in OPT Management (Transgenic plants, Industrial dsRNA products etc.)

Which previous course required?

Literature:

Thieman WJ, Palladino MA (2016) Introduction to Biotechnology: International Edition, 2 E, Question Bank

Renneberg R, Berkling V, Loroch V (2016) Biotechnology for beginners. Academic Press,

Renneberg R, Berkling V, Loroch V (2008) Green biotechnology. Academic Press New York,

Altman A, Hasegawa PM (2011) Plant biotechnology and agriculture: prospects for the 21st century. Academic press,

Kwon YM, Ricke SC (2011) High-throughput next generation sequencing: methods and applications. Springer,

Dickinson M (2004) Molecular plant pathology. Garland Science,

Marshall G, Walters D (1994) Molecular biology in crop protection. Springer,

Higgs PG, Attwood TK (2013) Bioinformatics and molecular evolution. John Wiley & Sons,

Materials provided: PPT, Video dan hand out

Requirements for exam:75% attendance

Teaching method(s)	Classes Special assignment related to the subject matters Student presentation

Workload (hrs).

1. Theoretical of course:13 times
2. Lab work:7 times
3. Home studies: related to the chapter discussed in the class