

Wollo University
College of Natural Science
School of Bioscience and Technology
Department of Biotechnology

Course Title: Molecular Markers and Their Application

Course Code: Biot 3121

Credit Hours: 3 Hrs (5 ECTS)

Instructor: Tadesse A. (MSc)

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Academic year: 2020

Year: III

Semester: II

Target groups: 3rd year Biotechnology Regular Students

Course description

Principles of inheritance; Qualitative and quantitative traits; Genetic markers: morphological, biochemical and molecular; Proteins and enzymes as markers; various types of DNA markers and basis of polymorphism; Hybridization based markers; PCR based DNA markers; Development of molecular markers; DNA fingerprinting in plant variety identification; Genetic diversity analysis; Germplasm characterization using molecular markers; Construction of genetic maps of plants: development of mapping populations, choice of marker system; Molecular mapping of simple and complex trait loci; Marker-assisted selection (MAS); Physical mapping and map-based cloning of genes.

Course Objectives

At end of this course, the students will be able to:

- ✎ Know the basic application of molecular markers
- ✎ Identify various types of molecular markers
- ✎ Know the DNA dependent & independent markers
- ✎ Understand DNA polymorphism

Contents	Reference Materials
Chapter 1: Introduction <ul style="list-style-type: none">▪ Principles of Inheritance▪ Qualitative and Quantitative Traits	Plant cell and tissue culture Principles and Applications, W. R. Sharp, P. O. Larsen, E. F. Paddock and V. Raghavan, Ohio State University Press, Columbus, Ohio. Springer New York.

Chapter 2: Genetic Markers 2.1. Types of Genetic Markers 2.1.1 Classical Markers 2.1.1.1. Morphological markers 2.1.1.2. Cytological markers 2.1.1.3 Biochemical markers 2.1.2 Molecular/DNA Markers 2.1.2.1. Hybridization based markers Restriction Fragment Length Polymorphism(RFLP) 2.1.2.2. PCR based DNA markers RAPD -Randomly Amplified Polymorphic DNA ISSR-Inter Simple Sequence Repeat AFLP -Amplification Fragment Length Polymorphism CAPS -Cleaved Amplified Polymorphic Site SSR -Simple Sequence Repeats (microsatellites) SNP --Single Nucleotide Polymorphisms DArT - Diversity Arrays technology markers	Molecular Breeding of Woody Plants, 2001, ISBN: 0-444-50958-5, ELSEVIER Molecular Breeding, C Kole, Albert G. Abbott, ISBN: 978-1-57808-5378, 2008, Science Publishers
Chapter 3 : Development of Molecular Markers <ul style="list-style-type: none"> How to develop a molecular markers 	Plant Molecular Breeding, H. J. Newbury, ISBN: 978-1-84127-3211, 2003, Wiley- Blackwell
Chapter 4 : Genetic Diversity Analysis by using different types of molecular markers <ul style="list-style-type: none"> What is genetic diversity How to analyze it by using molecular markers 	John C. Avise (2004). Molecular Markers, Natural History, and Evolution, Second Edition.
Chapter 5: Application of Markers <ul style="list-style-type: none"> Germplasm Characterization Construction of Genetic Maps Molecular mapping of simple and complex trait loci 	HJ Newbury (2003). Plant molecular breeding – theory put to practice. Blackwell Publishing Ltd, Oxford, UK; 2003. 265pp
Chapter 6 : Marker-Assisted Selection (MAS) and its Application	H. John Newbury (2003). Plant Molecular Breeding. Blackwell Publishing LTD, CRC Press LLC, 2000 Corporate Blvd., N.W., Boca Raton, FL 33431, USA.

Assessment arrangements and Grading

- ☞ **Test 1** will be given, which weights out of 15%
- ☞ **Test 2** will be given, which weights out of 15%
- ☞ Quizzes will be given, which weights out of 10%
- ☞ Group assignment will be given, which weights out of 10%
- ☞ The remaining 50 % will be for final exam.