

Gilad Gabay

Functional Genomic Approaches in Plant Breeding (001.2.2303)

Credits: 2

Required background: Genetics, Plant biology/Physiology

Course Description:

Functional genomics has provided a useful platform for advancing plant breeding in recent years. The emergence of various omics technologies, especially genomics, offers researchers a comprehensive understanding of the genetic mechanisms that control plant traits such as yield, disease resistance, tolerance to abiotic stress, and nutritional quality. The incorporation of functional genomics into plant breeding has allowed breeders to expedite the development of enhanced crop varieties. This course will cover advanced methods for gene identification and functional validation. Additionally, we will explore how to apply this knowledge in practical plant breeding programs.

Syllabus

Introduction

1. Molecular genetics and functional genomics: An overview
2. Classical plant breeding
3. DNA variations

Gene identification

4. Identification of genomic regions associated with trait of interest
Genome-Wide Association Studies (GWAS), Quantitative Trait Loci (QTL)
5. Linkage mapping: Identification of causal loci using experimental populations
6. Association mapping: Identification of causal alleles using natural populations
7. Multi-omics approach to gather information for enhancement of certain traits

Gene functional validation

8. Approaches for mutagenesis and mutant analyses
9. Transgenic approaches
10. Natural variation

Application in breeding programs

11. Marker-Assisted Breeding (MAB)
12. Introgression of natural and engineered variations in plant breeding programs

Exam and Grading:

Class attendance and participation (20%)

Written Final project (50%)

Final project Presentation (30%)