



The Hebrew University of Jerusalem

Syllabus

GENOTYPES (G) ENVIRONMENTS (E) AND MANAGEMENT (M) INTERACTION IN CEREALS BREEDING - 71999

Last update 22-03-2021

HU Credits: 2

Degree/Cycle: 2nd degree (Master)

Responsible Department: Field and Vegetable Crops

Academic year: 0

Semester: 2nd Semester

Teaching Languages: English

Campus: Rehovot

Course/Module Coordinator: R. Ben-David

Coordinator Email: roib@volcani.agri.gov.il

Coordinator Office Hours: Sunday 14:15-15:00

Teaching Staff:

Dr. Roi Ben David

Course/Module description:

Agriculture faces well known and daunting challenges in coming decades: growing human population, loss of agricultural lands, diminishing resource availability, and impacts of climate change. Concurrently, there is growing recognition of the urgency to modify or adapt current cropping systems to ensure long-term sustainability. Cereal breeding thus face the complex challenge of increasing productivity, in ever-harsher environments, while reducing the environmental footprint of production.

While genotype by environment interactions ($G \times E$) is a well-studied field, relatively few studies in cereals investigate the impact of crop management (M), and cropping systems, on $G \times E$. The workshop will look beyond the well-studied core-set of breeding traits in cereals and will discuss breeding opportunities to influence $G \times E \times M$ in our Mediterranean environment and globally.

Course/Module aims:

Workshop will include two sections: (1) introduction to cropping system sustainability, prospects of climate change and their associations. (2) describe trait-base examples from major cereals (mostly wheat and barley but also maize and rice) where breeding can exploit beneficial interactions with management to optimize both field production and sustainability.

Learning outcomes - On successful completion of this module, students should be able to:

Gain vast knowledge on the components of $G \times E \times M$ in field crops

Understand its complexity

Critically read and analyze field crop research studies which focuses on $G \times E \times M$ synergies and trade offs

Attendance requirements(%):

100

Teaching arrangement and method of instruction: Lecture and exercises

Course/Module Content:

Detailed syllabus:

-
1. The yield gap hypothesis and historical perspective of yield improvement
 2. Underling the core traits in cereal breeding and adaptation (phenology, grain yield, tolerance to biotic and abiotic stress and quality)
 3. The drivers of change in cereals cropping systems (climate change: rainfall unpredictability and scarcity, high temperature, demand for food production)
 4. Agronomy and management: mechanization, crop rotation, intensification, drip irrigation, precision agriculture
 5. Agronomy and management: reduced tillage, deep sowing, early sowing, manure application
 6. Field lab exercise (deep/early sowing of wheat GAR/GAI lines). Submit an exercise summery
 7. Trait1: establishment and early vigor in wheat and barley, long coleoptile
 8. Trait2: weed competitiveness
 9. Trait3: root architecture: vigor, density and depth
 10. Trait4: nitrogen uptake efficiency: the ability of roots to uptake N
 11. Trait5: stem characteristics: lodging resistance, carbohydrate storage and remobilization to grains
 12. Trait x Trait interactions and tradeoffs: shoot and root vigor, root vs. tillering, structural biomass vs. grain yield, microbiome-soil disease- phosphorus use efficiency
 13. Student presentations
 14. Student presentations

Required Reading:

Relevant scientific articles and reviews will be provide to the students

Additional Reading Material:

Grading Scheme:

Additional information:

-