

Agrogenomics

Code: 101939
ECTS Credits: 6

Degree	Type	Year	Semester
2500890 Genetics	OT	4	0

Contact

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Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Josep Maria Folch Albareda
Jordi Jordana Vidal
Jesús Piedrafita Arilla
Carlota Poschenrieder Wiens
Joaquín Casellas Vidal

External teachers

Amparo Monfort
Jordi Garcia
Maria Jose Aranzana
Marta Pujol
Pere Arús
Werner Howad

Prerequisites

There are no official requirements to enroll in Agrigenomics, but it would be good to meet the following conditions:

- The students should know the basics of Quantitative Genetics and Breeding
- The student should be able to read texts written in English

Objectives and Contextualisation

Teaching goals:

1. Becoming familiar with genetic improvement strategies and understanding their connection with the food industry.
2. Knowing the main structural and functional features of the genomes and transcriptomes of domestic plant and animal species.
3. Understanding how genetic data can be used to elaborate biological hypotheses about the physiology of organisms.
4. Developing methods aimed to genetically evaluate candidates to breeders and understanding the factors that limit the rate of genetic progress associated with distinct selection strategies.
5. Being aware of the genetic basis of hereditary diseases that afflict domestic species.
6. Acquiring a perspective about the techniques involved in identifying major genes affecting complex traits and their application to genomics and breeding.
7. Acquiring the skills to estimate the amount of genetic diversity based on molecular and genealogic data.
8. Knowing the scientific basis of the techniques dedicated to improve the productivity of crops.
9. Understanding how -omic tools can be employed to the genetic improvement of domestic animals and plants.

Content

SECTION 1. GENETIC IMPROVEMENT AND GENOMICS OF DOMESTIC PLANTS

Theme 1: Productivity and yield of crops. Sustainable production and need of improvement . Factors limiting productivity.

Theme 2: Stress, resistance, tolerance and acclimation and their genetic basis.

Theme 3: Genetics of plant reproduction (autogamy, allogamy and apomyxia) and their consequences for production and improvement.

Theme 4: Sexual reproduction and seed technology. Production of hybrid seeds.

Theme 5: Asexual reproduction, in vitro reproduction and cloning.

Theme 6: Selection and genetic improvement (massal, recurrent, backcrossing).

Theme 7 (1):Methods of genetic analysis of agronomic traits with markers. Map construction. Major genes and quantitative traits. Mapping and positional cloning of genes.

Theme 7 (2): Application of genetic markers to plant improvement: maker-assisted selection (MAS) and gene introgression assisted by markers (MAI).

Theme 8 (1):Methods for discovering SNPs and high throughput genotyping. An example in vegetables.

Theme 8 (2): Analysis and use of genetic variability in plant genetic improvement. Study of parentals. Association analysis. Whole-genome selection and genomic selection.

Theme 9: Plant transcriptomics applied to the study of crops.

Theme 10: Genome sequencing and resequencing for the analysis of plant populations. Example in small fruits.

Theme 11: Genomics applied to the improvement of rosaceae.

Theme 12: Genomics applied to the improvement of cucurbitaceae.

SECTION 2. GENETIC IMPROVEMENT AND GENOMICS OF DOMESTIC ANIMALS

Theme 13. An introduction to the genetic improvement of domestic animal species. Companies and breeder associations.

Theme 14. Genetic improvement and genomics of ruminants. Genome sequencing projects. Identification of QTL influencing milk yield and quality and resistance to diseases. Genomic selection.

Theme 15. Genetic improvement and genomics of pigs. Genetic parameters. Evaluation and selection of breeders with BLUP and genomic selection. Identification of QTL and sequencing of the porcine genome.

Theme 16. Genetic improvement and genomics of rabbits. Organization of rabbit breeding. Genome sequencing, identification of QTL and transgenesis.

Theme 17. Dog and cat genomics. Genome sequencing. Population structure. Causal mutations. Genome-wide association analysis.

Theme 18. Genetic improvement and genomics of chickens. Meat and egg traits of economic interest. Sequencing of the chicken genome. Identification of QTL and transgenesis.

Theme 19. Breed conservation: The problem of conservation. Causes of racial regression. Strategies and methods of conservation. Genetic aspects of conservation.

Theme 20. Hereditary diseases in domestic species. Diseases caused by single nucleotide substitutions. Trinucleotide expansions. Retrotransposon insertions. Pathologies caused by copy number variation.