

## Molecular Plant Breeding (I002628)

**Cursusomvang** *(nominale waarden; effectieve waarden kunnen verschillen per opleiding)*

**Studiepunten 5.0** **Studietijd 150 u**

**Aanbodsessies en werkvormen in academiejaar 2023-2024**

A (semester 1)	Engels	Gent	excursie hoorcollege werkcollege
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**Lesgevers in academiejaar 2023-2024**

Geelen, Danny	LA21	Verantwoordelijk lesgever
Haesaert, Geert	LA21	Medelesgever
Maenhout, Steven	LA21	Medelesgever

**Aangeboden in onderstaande opleidingen in 2023-2024**

	stptn	aanbodsessie
<a href="#">Master of Science in Bioscience Engineering: Cell and Gene Biotechnology</a>	5	A
<a href="#">Uitwisselingsprogramma bio-ingenieurswetenschappen: cel- en genbiotechnologie (niveau master-na-bachelor)</a>	5	A

**Onderwijstalen**

Engels

**Trefwoorden**

Selection, genetic marker, linkage map, association mapping, quantitative trait locus (QTL), marker assisted selection (MAS), genomics, GWAS, pre-breeding, genome elimination, hybrids, mutation

**Situering**

Plant breeding is an ancient discipline that creates new genotypes adapted to specific growing conditions (e.g. abiotic and biotic stress), crop management techniques (e.g. mechanization, one-time harvest) and that addresses consumers and society requirements (e.g. food processing, nutritional value, etc.). With the advent of molecular genetics and genomics, the array of tools and methods has drastically expanded making the plant breeding process more efficient. Moreover, molecular genetics creates the possibility to introduce new characteristics. This course begins with an introduction to the basics of plant breeding (creating diversity and selection methods), which is a prerequisite to understand and implement molecular tools in plant breeding programs. The second part of the course will address molecular techniques for the characterization of genomes in the context of breeding (e.g. diversity screening, developing molecular markers, etc.). The third part of the course will highlight some of the most recent advances in sexual reproduction and genome analysis. This is relevant for the student who has an interest in engaging in research that aims to improve or develop new technologies useful for plant breeding and plant genetic studies.

**Inhoud**

1. Basic principles of plant breeding e.g. diversity, heritability, back crosses and selection methods.
2. Molecular principles of selection
  - DNA-fingerprinting of plants
  - DNA-marker technologies and interpretation of DNA marker results
  - Estimation of genetic relationships, diversity using DNA-markers
  - Germplasm characterisation
  - Population genetics
  - Linkage, 'Linkage Disequilibrium' (LD) and association genetics
  - Strategies for the identification of markers linked to traits of agricultural relevance

- Marker assisted selection programs
- Genomics breeding
- 3. Advanced breeding tools.
  - Doubled haploid production,
  - genome elimination,
  - chromosome substitution lines,
  - apomixis,
  - modulation of meiotic recombination,
  - polyploidization,....

#### **Begincompetenties**

Basic knowledge of plant genetics, molecular biology and statistics

#### **Eindcompetenties**

- 1 Have knowledge on the principles of plant breeding
- 2 Have knowledge of methodologies available for the identification of a genetic locus associated with a plant trait.
- 3 Apply DNA-marker technologies in plant breeding
- 4 Have insight into 'marker assisted selection' and 'genomics assisted selection'
- 5 Analyze molecular data used for plant breeding
- 6 Have knowledge on ongoing research in the field of molecular plant breeding

#### **Creditcontractvoorwaarde**

Toelating tot dit opleidingsonderdeel via creditcontract is mogelijk mits gunstige beoordeling van de competenties

#### **Examencontractvoorwaarde**

Dit opleidingsonderdeel kan niet via examencontract gevolgd worden

#### **Didactische werkvormen**

Werkcollege, Excursie, Hoorcollege

#### **Leermateriaal**

All materials will be provided in electronic form. Materials include: notes, presentations and research papers. Estimated total cost: 20 EUR

#### **Referenties**

Papers extracted from scientific journals in the field of plant breeding

#### **Vakinhoudelijke studiebegeleiding**

Personal: through electronic appointments. Interactive help using Ufora

#### **Evaluatiemomenten**

periodegebonden en niet-periodegebonden evaluatie

#### **Evaluatievormen bij periodegebonden evaluatie in de eerste examenperiode**

Schriftelijke evaluatie met open vragen

#### **Evaluatievormen bij periodegebonden evaluatie in de tweede examenperiode**

Schriftelijke evaluatie met open vragen

#### **Evaluatievormen bij niet-periodegebonden evaluatie**

Participatie, Werkstuk

#### **Tweede examenkans in geval van niet-periodegebonden evaluatie**

Examen in de tweede examenperiode is niet mogelijk

#### **Toelichtingen bij de evaluatievormen**

Students are evaluated during the lectures when they are presenting an overview of an allocated subject and during the discussion after presentations.

#### **Eindscoreberekening**

The written exam will have a weight of 65% in the calculation of the final score; the assignment will have a weight of 35% in the calculation of the final score.

Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.