

Plant Yield (C003163)

Course size *(nominal values; actual values may depend on programme)*

Credits 3.0 **Study time** 80 h **Contact hrs** 25.0h

Course offerings and teaching methods in academic year 2022-2023

A (semester 1)	English	Gent	lecture	15.0h
			online lecture	0.0h

Lecturers in academic year 2022-2023

Nelissen, Hilde	WE09	lecturer-in-charge
Inzé, Dirk	WE09	co-lecturer

Offered in the following programmes in 2022-2023

	crdts	offering
Master of Science in Biochemistry and Biotechnology	3	A
Master of Science in Plant Biotechnology	3	A
Exchange programme in Biochemistry and Biotechnology (master's level)	3	A

Teaching languages

English

Keywords

Plant yield, crop improvement, grain yield, systems biology of yield.

Position of the course

The exponentially growing world population necessitates that agricultural production needs to increase by at least 70% by the year 2050. This increased food production will have to be accomplished on less land area and is likely to face additional limitations due to climate changes. In addition, plants also have a great promise in providing renewable resources, including bio-energy and industrial building blocks.

The aim of this course is to introduce various factors to further increase crop yield. Emphasis will be given to the molecular processes governing crop yield and how to use state-of-the art insights for crop improvement through advanced plant breeding and biotechnology. The students will be challenged to think about possible strategies to improve crop yield.

Contents

1. Crop yield: concepts, tools and components of yield.
2. Interception of solar energy by leaves. Leaf size, number and position. Leaf senescence and yield.
3. Photosynthesis and photorespiration. C3 and C4 plants. Leaf photosynthesis and canopy properties. Respiration and crop yield.
4. The harvesting index. Assimilate partitioning in crops. Sink-source relationships. Shoot-root interactions.
5. Grain yield. Rice as a model: number of panicles; number of seeds per panicle; grain weight. How to improve through advanced breeding and biotechnology grain yield in cereals.
6. Mechanisms orchestrating plant growth and biomass production. What determines plant organ size?
7. Factors limiting yield: water use efficiency and nitrogen use efficiency. How to improve water and nitrogen use efficiency through advanced breeding and biotechnology.
8. Crop yield in a changing environment. Certain developmental stages are more sensitive to environmental stress than other stages. Corn yield as an example.

9. Systems biology to understand plant yield. Growth is governed by complex molecular networks of genes. How to study these networks and how to identify key players regulating growth?

10. Crop yield from an agro-biotech industry perspective.

The course also consists of a visit to a field trial and a training in phenotyping.

Initial competences

Knowledge of the fundamental biotechnological terms and techniques.

Final competences

1 The student knows and understands the principles and concepts of plant yield.

2 The student will be acquainted with the technologies and methodologies to improve plant yield.

3 The student will be able to recognize plant yield-related problems and to critically think about solutions.

4 The student will be able to summarize the literature and discussions on plant yield related topics.

5 The student can actively discuss on plant yield related topics.

Conditions for credit contract

Access to this course unit via a credit contract is unrestricted: the student takes into consideration the conditions mentioned in 'Starting Competences'

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Online lecture, Lecture

Extra information on the teaching methods

Classroom lectures, discussions, debate, micro-teaching, individual work.

Learning materials and price

Powerpoint slides and articles on Ufora.

References

All articles referred to will be indicated in the PowerPoint slides and will be available online via Ufora.

Course content-related study coaching

Lecturer's e-mail and office hours will be provided upon request during lectures and via the course webpage.

Assessment moments

continuous assessment

Examination methods in case of periodic assessment during the first examination period

Examination methods in case of periodic assessment during the second examination period

Examination methods in case of permanent assessment

Report, Participation, Peer assessment, Assignment

Possibilities of retake in case of permanent assessment

not applicable

Calculation of the examination mark

Participation in discussion: 10

Micro-teaching of a yield related problem: 5

Essay on the yield related problem incorporating discussion/debate: 5

the micro-teaching will be evaluated by the fellow students (peer-review)