UNIVERSITEIT GENT

Studiefiche

Academiejaar 2023-2024

Plants and Microclimate (I002627)

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	hoorcollege groepswerk zelfstandig werk practicum

Lesgevers in academiejaar 2023-2024

Steppe, Kathy	LA21	Verantwoordelijk lesgever

Aangeboden in onderstaande opleidingen in 2023-2024	**stptn**	**aanbodsessie**
Master of Science in Bioscience Engineering: Cell and Gene Biotechnology	5	A
Master of Science in de bio-ingenieurswetenschappen: landbouwkunde	5	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: cel- en genbiotechnologie (niveau master-na-bachelor)	5	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: landbouwkunde (niveau master-na-bachelor)	5	A

Onderwijstalen

Engels

Trefwoorden

Plant-environment interactions, plant-water relations, plant hydraulics, photosynthesis, respiration, abiotic stressors (temperature, drought, atmospheric CO2, frost, salinity, wind), climate change, plant sensors, ecophysiological instrumentation, mechanistic models, ecophysiology, biophysics, environmental plant physiology

Situering

This course provides a quantitative approach to plant-environment interactions based on knowledge of the underlying mechanisms. We will combine environmental biophysics, plant physiology and molecular signaling in response to stress to provide a quantitative basis for the study of plant-related problems. To this end, we will study in detail the plant-water relations and the dynamic water transport through plants, as well as growth, photosynthesis and respiration and this in close concert with how environmental factors (light, heat, drought, atmospheric CO2, frost, salt, wind) and molecular factors may influence these processes. The aim is to be able to quantify the impact of abiotic stressors and environmental changes on crops and trees. Examples from recent literature and own research will be discussed. Practical training with appropriate sensors, instrumentation and quantitative methods/models is organized in small groups.

Inhoud

THEORY

1| Plant hydraulics

1.1 Fundamental aspects: role of water in plants, water content and water potential
1.2 Water relations at cell and leaf level: turgor, osmotic adjustment
1.3 Stomata: morphology, function, transpiration and responses to the environment
1.4 Water relations at plant level: water movement in plants, root pressure, daily dynamics and hydraulic redistribution
1.5 Embolism formation: causes, vulnerability curves, embolism repair and capacitive discharge

2| Photosynthesis and respiration

2.1 Leaf and chloroplast structure, and pigments
2.2 Light and dark reactions of photosynthesis in C3, C4 and CAM plants
2.3 Environmental drivers of photosynthesis and climate change effects on ecophysiology
2.4 Respiration and origin, fate and significance of CO2 in stems
2.5 Phloem transport and plant-PET
3| Modelling plant responses to environmental factors and assessing the implications
3.1 Mechanistic modelling
3.2 Functional-structural plant modelling (3D plant modelling)

EXERCISES
Technical notes on instrumentation and practical hands-on training
1 Pressure chamber and thermocouple psychrometer
2 Diffusion porometer
3 Stomatal characteristics (replica method)
4 Gas exchange systems for measurement of photosynthesis, respiration and transpiration
5 Measurement systems for chlorophyll fluorescence
6 Sap flow sensors
7 Dendrometers and linear variable displacement transducers
8 Development of vulnerability curves to induced embolism

Begincompetenties

There are no specific requirements.

Eindcompetenties

1 Explain the mechanisms underlying plant hydraulics, photosynthesis, phloem transport, and respiration
2 Assess the practical implications of plant hydraulics and carbon metabolism and how this is linked with molecular processes
3 Link plant hydraulics to knowledge on photosynthesis and growth for estimating the growth potential and resistance to abiotic stressors (heat, drought, atmospheric CO_2, frost, salt, wind)
4 Assess physiological and molecular responses of plants to abiotic stressors and environmental changes (associated with climate change)
5 Study plant-related problems with a quantitative background on plant-environment interactions
6 Apply ecophysiological instrumentation, and interpret the results

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

Groepswerk, Hoorcollege, Practicum, Zelfstandig werk

Toelichtingen bij de didactische werkvormen

Lectures and demonstrations are supported by slides; Practical and fieldwork are performed under supervision.

Leermateriaal

Lecture notes are available. Total cost: 20 euro

Referenties

Hamlyn JG (2013) Plant and microclimate. A quantitative approach to environmental plant physiology. Cambridge University Press, 395 pp.
Lambers H, Stuart Chapin III F, Pons TL (1998) Plant Physiological Ecology. Springer, 540 pp.
Nobel PS (2009) Physicochemical and environmental plant physiology. 4th ed. Academic Press, 604 pp.

Vakinhoudelijke studiebegeleiding

Questions can be asked before or after each lecture, or when making an appointment. Ufora will be used to communicate about practical issues.

Evaluatiemomenten

periodegebonden en niet-periodegebonden evaluatie

Evaluatievormen bij periodegebonden evaluatie in de eerste examenperiode

Mondelinge evaluatie

Evaluatievormen bij periodegebonden evaluatie in de tweede examenperiode

Mondelinge evaluatie

Evaluatievormen bij niet-periodegebonden evaluatie

Werkstuk

Tweede examenkans in geval van niet-periodegebonden evaluatie

Examen in de tweede examenperiode is niet mogelijk

Eindscoreberekening

Theory exam: periodic evaluation (70%)
Practical exam: non-periodic evaluation (10%) and periodic evaluation (20%)
Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.