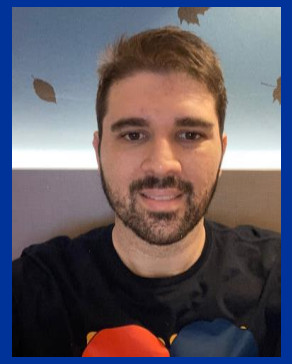
BrIAS W07: Biostimulation & Plant Protection

Prof. **Patrick du Jardin**
Université de Liège

Mr. **Thomas Hainaux**
Biotalys N.V.

Dr. **Marco Zarattini**
Université libre de Bruxelles



Dr. **Joao PL Franco Cairo**
University of York

Dr. **Federica Locci**
Max Planck Institute for Plant Breeding and Research

Maria Cristina Della Lucia
University of Padova

Prof. **Pierre Van Cutsem**
FytoFend S.A.
Université de Namur

10:00-16:00 CET | Wednesday 16 March 2022 | ULB-Campus Plaine, Salle Solvay NO5 - Online Teams

W07 – Biostimulation & Plant Protection

Time: Wednesday March 16th 2022, 10:00-16:00

Location: ULB Campus Plaine, Building NO_05, Solvay Room, or **online**

Organizers: david.cannella@ulb.be
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Schedule:

10:00-10.10 Welcome

10:10-10.40 **Prof. Patrick du Jardin**
Plant Biology Laboratory, Gembloux Agro-Bio Tech, University of Liège, Belgium.
How should we validate the functional claims of plant biostimulants?

10:40-11:10 **Dr. Federica Locci**
Max Planck Institute for Plant Breeding and Research, Koln, Germany
Sensing the danger: plant immunity orchestration against pathogenic elicitors

11:10-11:40 **Mr. Thomas Hainaux**
Biotalys N.V., Ghent, Belgium
Biotalys: re-inventing food protection

11:40-12:10 **Maria Cristina Della Lucia**
Department of Agronomy, Food, Natural resources, Animals and Environment, Università di Padova, Padova, Italy
Evaluation of commercial biostimulants effects on cultivated plants

12:10-13:40 Lunch break

13:40-14:10 **Dr. Marco Zarattini**
Crop Production and Biostimulation Laboratory, Université libre de Bruxelles, Brussels, Belgium
Sweet Immunity: an overview of cell wall-derived sugars eliciting defense in plants

14:10-14:40 **Prof. Pierre Van Cutsem**
FytoFend S.A. and Université de Namur, Namur, Belgium
Differential regulation of gene expression in dicots vs monocots treated by the COS-OGA elicitor

14:40-15:10 **Dr. Joao PL Franco Cairo**
University of York, York, united kingdom
Targeting lytic polysaccharide monooxygenases for agricultural pest control

15:40-16:00 **Closing remarks**

Please confirm participation by e-mail (christian.hermans@ulb.be) before Monday March 14th 2022.

The Covid Safe Ticket (CST) is required to access that event. Wearing a mask is mandatory while seated in the theater.

About BrIAS *- The newly founded Brussels Institute for Advanced Studies (BrIAS), co-founded by the Université libre de Bruxelles (ULB) and the Vrije Universiteit Brussel (VUB), aims to expand upon the mission of other IASes as an incubator of ideas and research by focusing on current and urgent themes with a great societal impact.*
Located in the heart of Brussels, it aims to attract the very best scientists, artists or designers, coming from various fields or countries and with no philosophical or political restriction, and provide the opportunity to work in an atmosphere of complete freedom, collaboration, mutual emulation and cross-fertilisation. In this context, BrIAS aims to facilitate collaborations with countries facing critical challenges pertaining to sustainability.
For more information and updates about BrIAS, our upcoming events, and our current research theme ***The past, present and future of food, climate and sustainability****. Follow us on our* ***webpage****, on* ***LinkedIn*** *and* ***Facebook****.*

The event is organized in junction with the Ecole doctorale thématique (EDT) Plant Science, F.R.S.-FNRS.

Prof. **Patrick du Jardin**

How should we validate the functional claims of plant biostimulants?

Plant biostimulants have been accepted as a new regulatory category of fertilizing products in different parts of the world, but their properties and use still need to be clarified. The main reason for this is that their definition is based on claims of agricultural effects - which are increased nutrients use efficiency, improved tolerance to abiotic stress, enhanced product qualities and increased availability of soil nutrients, according to the new regulation (EU) 2019/1009 – but how these claims should be substantiated in practice is still unclear, generating skepticism among growers. The EU approach consists of defining harmonized standards, relating to agreed definitions, quality criteria and protocols for generating data on product efficacy. Compliance of the data package provided by the companies with the adopted standards will be regarded as sufficient to validate product claims, as indicated on the labels of CE-marked products. Notwithstanding the regulatory developments, achieving confidence in the products will depend on the scientific knowledge of the mechanisms of biostimulation. Although many scientific articles on biostimulants have been published in peer-reviewed journals over the last decade, several bottlenecks can be identified in the understanding of biostimulants' action. Further difficulties stem from the blurred borders between biostimulation and biocontrol, and also between nutrients and biostimulants, with some nutrients acting on physiological processes in ways that are similar to those of biostimulants. Ways to tackle some of the above issues will be discussed.

Dr. **Federica Locci**

Sensing the danger: plant immunity orchestration against pathogenic elicitors

The recognition of elicitor molecules such as pathogen-derived "microbe-associated molecular patterns" (MAMPs) and/or endogenous "damage-associated molecular patterns" (DAMPs) is a key feature of both plant and animal immunity. As a first "layer" of defence, plants rely on plasma membrane-localized receptors ("pattern recognition receptors", PRRs), which detect elicitors and consequently activate immune responses, collectively going under the name of "pattern-triggered immunity" (PTI). However, pathogens evolved effector molecules which can block PTI ones injected inside the host cell. As a countermeasure, plants co-evolved intracellular receptors ("nucleotide-binding domain and leucine-rich repeats", NLRs) which activate a second, more robust, "layer" of plant immunity ("effector-triggered immunity", ETI) upon effector recognition. Recently, evidences have been provided showing that PTI and ETI, previously thought to be separated, may be connected by potentiating each other. Our work demonstrated how plants perceive a specific class of elicitors and how they cope with balancing the immunity/fitness trade-off. Moreover, our most recent discoveries provided evidence for the PTI and ETI link, by discovering molecular components that are involved in both "branches". Our basic research aims to shed light on crucial plant immunity mechanisms which can then be utilized to build new research directions, transfer of resistance modules between species, and crop breeding.

Mr. **Thomas Hainaux**

Biotalys: re-inventing food protection

Biotalys is an Agricultural Technology company focused on addressing food protection challenges with proprietary protein-based biocontrol solutions. Based on its novel AGROBODY™ technology platform, Biotalys is developing a strong and diverse pipeline of effective product candidates with a favourable safety profile that aim to address key crop pests and diseases across the whole value chain,

from soil to plate. Biotalys was founded in 2013 as a spin-off from the VIB (Flanders Institute for Biotechnology) and is listed on Euronext Brussels since July 2021. The company is based in the biotech cluster in Ghent, Belgium. Moreover, Biotalys was awarded a multi-year grant from the Bill & Melinda Gates Foundation, funding research into new biological solutions against fungal disease caused by Cercospora on cowpea and other legumes. Evoca™, Biotalys' first biocontrol fungicide, holds great promise and demonstrated excellent results for protecting grapes and strawberries against Botrytis cinerea grey mould and powdery mildew. The product is expected to be introduced in the US later in 2022, following approval by the US Environmental Protection Agency (EPA)

Maria Cristina Della Lucia

Evaluation of commercial biostimulants effects on cultivated plants

Commercial plant biostimulants are products that stimulate plant natural nutrition processes, enhance nutrient use efficiency, abiotic stress tolerance, promote plant growth, and crop quality traits. For these reasons, such products find specific applications in agriculture. As part of my Ph.D. project, I focus on the evaluation of different biostimulant products, with particular attention to the identification of physiological and molecular mechanisms caused by their action, in different crops. Two research topics will be presented. The first one describes the effects of a leonardite-based biostimulant on sugar beet yield parameters in a field trial. In this experiment, the effect of the treatment on the composition of the phyllosphere microbiome has been tested as well, both in controlled and field conditions. The second research work was conducted to evaluate the effects of a calcium-based biostimulant product on tomato through the analysis of leaf transcriptome. Physiological parameters such as photosynthetic rate and chlorophyll content under water deficiency conditions have been measured to phenotype the plants. Far from being exhaustive, overall our results were partially disentangling the complexity underlying two biostimulants mechanisms of action and were showing improved interesting crop traits and stress mitigation.

Dr. **Marco Zarattini**

Sweet Immunity: an overview of cell wall-derived sugars eliciting defense in plants

Contrary to mammalian cells, plant cells are surrounded by a dynamic barrier made up of a complex matrix of polysaccharides and glycoproteins defined as cell wall. Historically, the plant cell wall was thought to provide only a passive physical obstacle to pest invasion. On the other hand, research over the last decades pointed out the cell wall as a molecules reservoir useful to signal ecological constraints. For instance, during plant-pathogen interaction, to get into the plant cells pathogens deploy an arsenal of deconstructive enzymes defined as cell wall degrading enzymes. These enzymes convert structural polysaccharides, such as cellulose, hemicellulose and pectin, into shorter sugars oligomers. In response, plants have evolved the capacity to perceive these sugars, the so-called "danger molecules", triggering Damage Triggered Immunity. In this talk, an overview of the release of cell wall-derived sugars, perception and elicitation will be illustrated.

Prof. **Pierre Van Cutsem**

Differential regulation of gene expression in dicots vs monocots treated by the COS-OGA elicitor

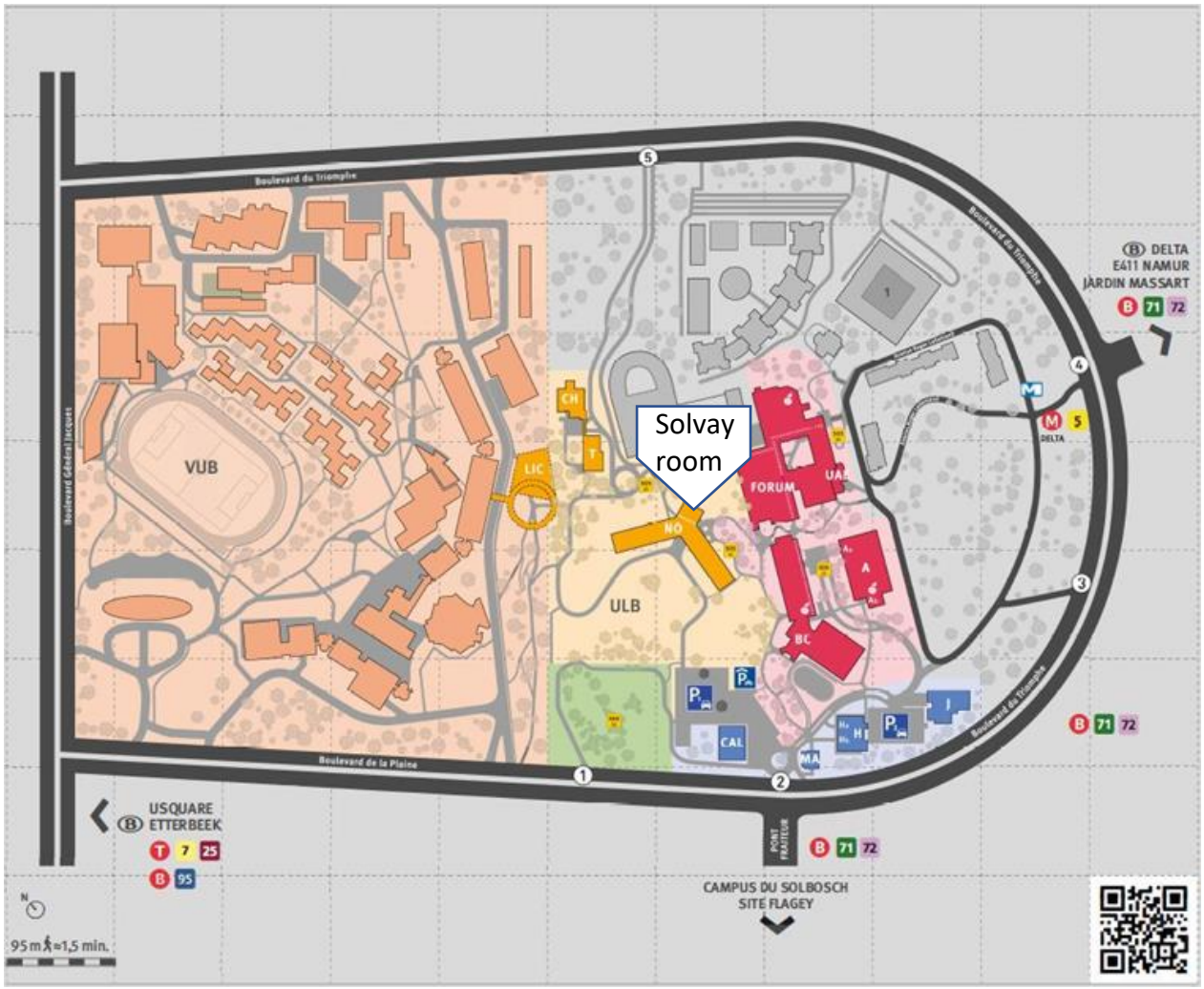
Plant elicitation is now an increasingly used technique in environmentally friendly crop protection. The COS-OGA active substance is a complex of chitosan and pectin oligomers that associate in the presence of calcium ions and monovalent cations. This oligosaccharide complex has been known for more than twelve years, it is registered in Europe and overseas, it is manufactured and marketed by

the company FytoFend and is used in both organic and conventional agriculture. The main uses concern the preventive protection of dicotyledonous crops such as grapevines against powdery mildew and downy mildew, but also on many vegetable crops. In this presentation, we will explore the comparative response of a dicot species, tomato, with a monocot, rice, following treatment with a commercial formulation of the COS-OGA elicitor, FytoSave®. Using RNAseq, we will focus on differential gene transcription in these two species to try to understand their response strategies to the presence of these PAMP-DAMP molecular motifs. In particular, we will examine the impact of elicitation on photosynthetic electron flow in tomato and indirectly on the redox homeostasis of the plant and thus on the host-pathogen interaction

Dr. **Joao PL Franco Cairo**

Targeting lytic polysaccharide monooxygenases for agricultural pest control

Lytic Polysaccharide Monooxygenases (LPMOs) are a class of copper-dependent enzymes that cleave crystalline and non-crystalline polysaccharides throughout an oxidative mechanism rather than the classical hydrolysis employed by cellulases. The first LPMOs families were discovered in saprophytic fungi and bacteria, which secrete these enzymes to break down their main carbon source, lignocelluloses, or chitins. Recently, chitin active LPMOs were also reported in insects, and they were not only correlated with digestion physiology, but also with chitin remodelling during moulting and other developmental processes. In this talk, we will focus on the structural and chemical biologies of insect LPMOs, mainly those derived from termites. We will also discuss the latest results from our group, correlating them with the actual literature, aiming to target this group of enzymes for crop pest control through RNAi technologies.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