

# Testing biostimulants to validate the claims through multi-scale assays and a meta-analysis

Introduction to the *BioStimTest* project

Martin Quiévreux

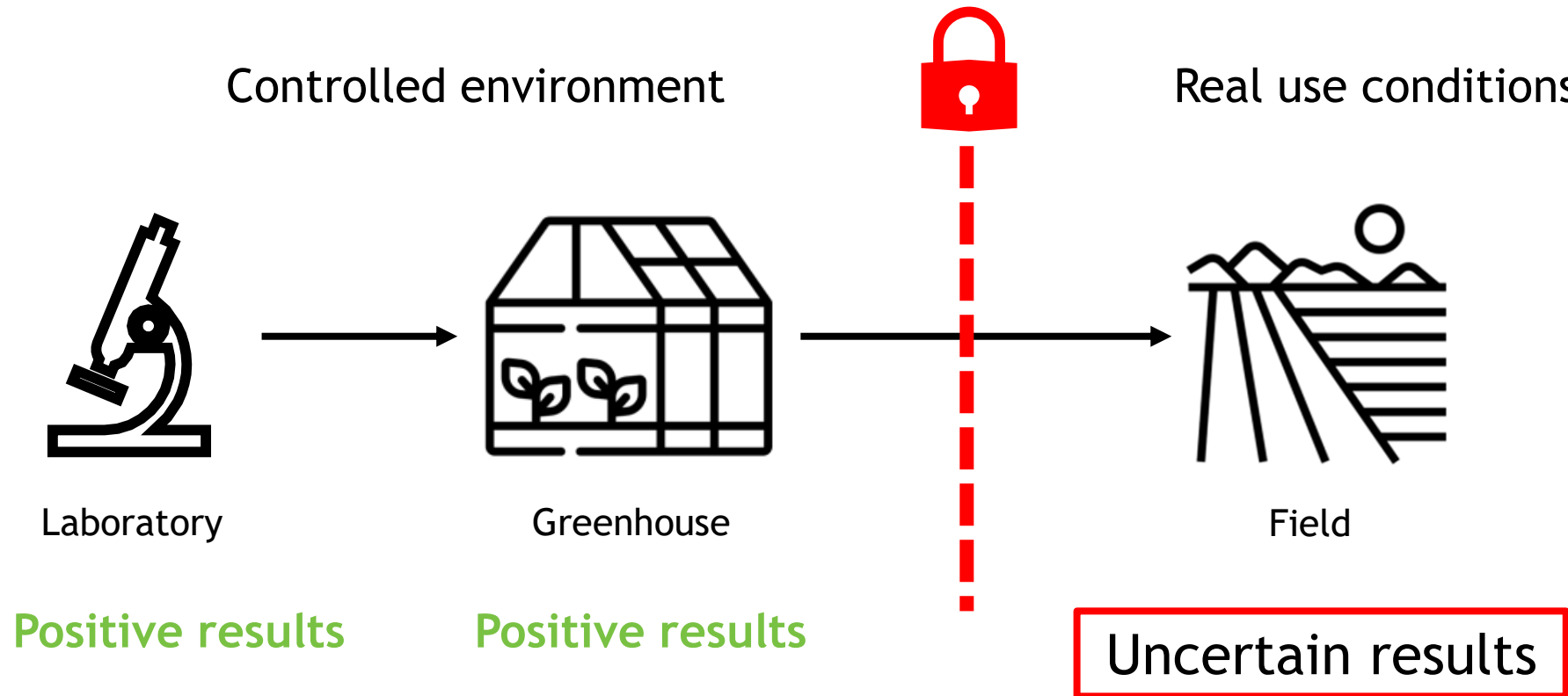
## Supervisors

Pr. Patrick du Jardin &  
Dr. Pierre Delaplace,  
Plant Sciences Axis

21st September 2022

# « From the lab to the field » issue

See Roupael *et al.* (2018)



⇒ How to ensure the efficacy of (new) products in real use conditions ?

# Official definition of « biostimulant »



Regulation (EU) 2019/1009.

A plant biostimulant shall be an EU fertilising product the function of which is to stimulate plant nutrition processes **independently of the product's nutrient content** with the sole aim of **improving one or more of the following characteristics** of the plant or the plant rhizosphere:

- (a) nutrient use efficiency;
- (b) tolerance to abiotic stress;
- (c) quality traits;
- (d) availability of confined nutrients in soil or rhizosphere.

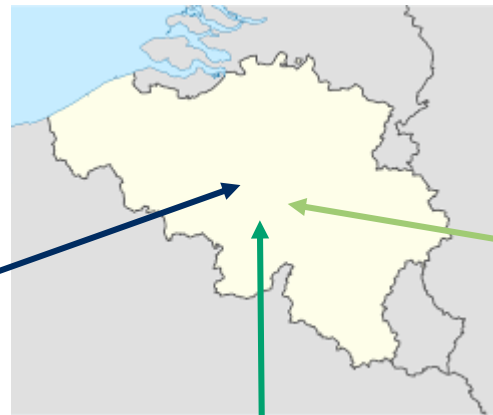
⇒ **Which protocols to validate the biostimulant claims ?**

# What is the *BioStimTest* project ?

Development and evaluation of small-scale protocols for their capacity to predict the field efficacy of biostimulants.

## Project partners

Hydroponic culture and plants in pots (Louvain-la-Neuve).



*In vitro* culture, plants in pots, hydroponics, germination tests (Gembloux).



Field trials (Fleurus)



⇒ **Establish an evaluation platform for biostimulants.**

## Project funders



# Multi-scale assays: growing conditions

Experiments in laboratory, in greenhouse and in field (with controlled fertilization and rainout shelters use) are set up.



*In vitro* bioassay, photo by M. Quiévreux (GABT-ULiège).



In pots bioassay, photo by PhD S. Lengrand (UCLouvain).

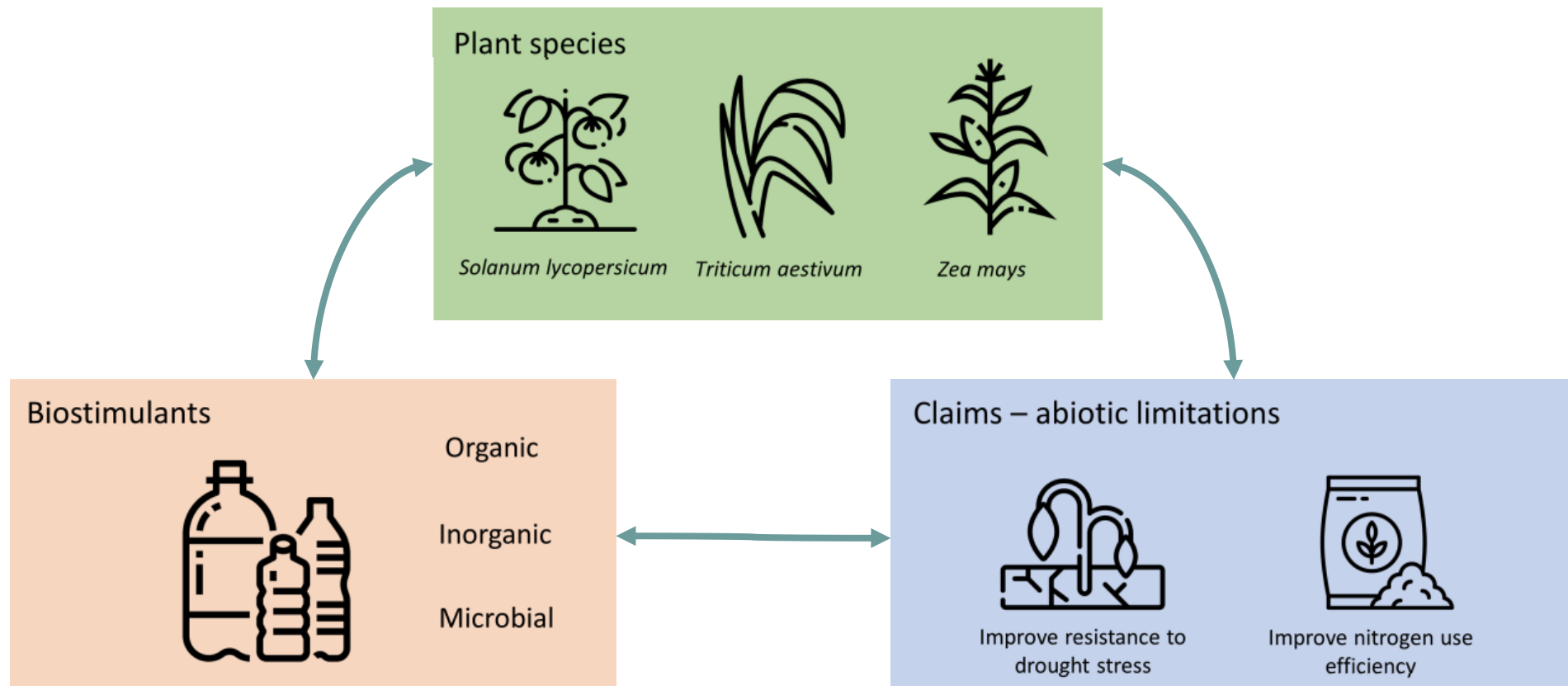


Field trial, photo by W. Falesse (Redebel sa).

# Multi-scale assays: biostimulant products and claims

Figures from Lengrand *et al.* (2022)

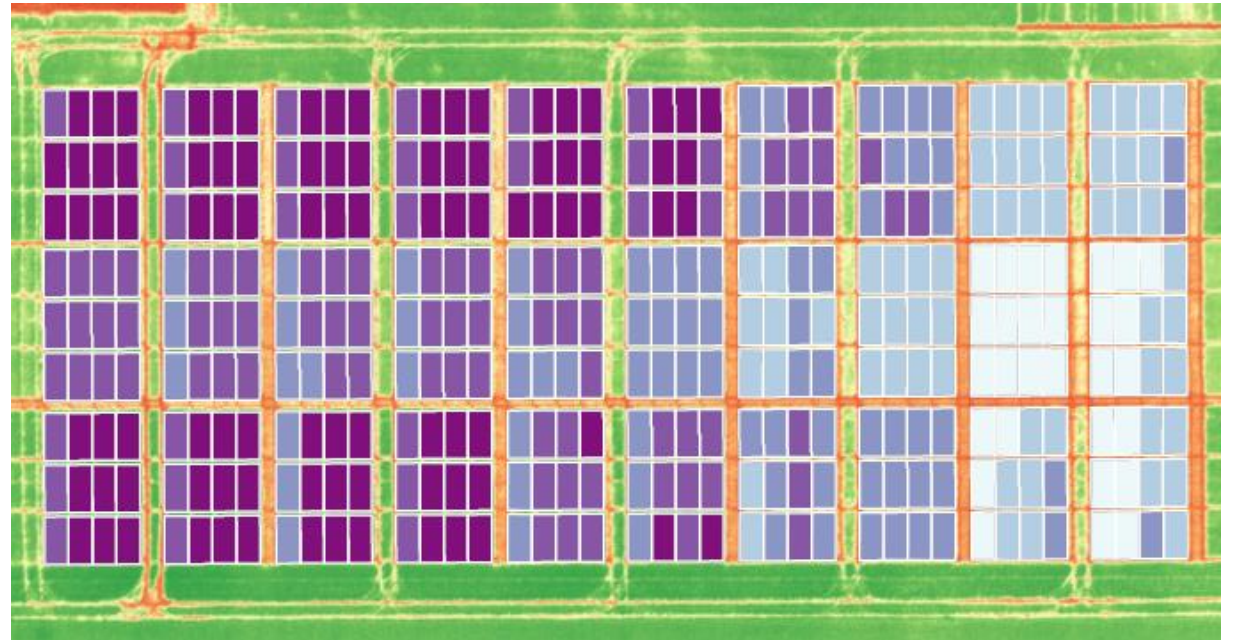
Selection of the project characteristics.



# Multi-scale assays: field crop phenotyping

Image from Quiévreux *et al.* (2021)

- Field crop phenotyping and drone imaging ;



Multispectral picture of the trials on nitrogen use efficiency in winter wheat (April 2021).

# Multi-scale assays: phenotyping in growth rooms

Image from Quiévreux *et al.* (2021)

- Field crop phenotyping and drone imaging ;
- Hydroponic cultures and plants in pots phenotyping ;

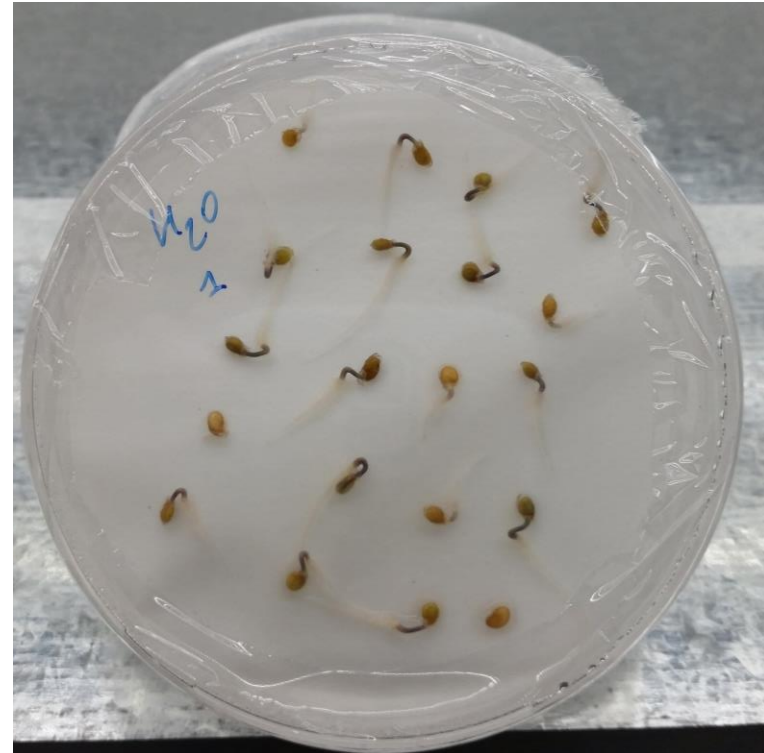


Tobacco plants (var. Xanthi) grown on solid substrate and with different water stress levels.



# Multi-scale assays: germination tests

- Field crop phenotyping and drone imaging ;
- Hydroponic cultures and plants in pots phenotyping ;
- Germination tests in Petri dishes ;



Germinated tomato (var. MoneyMaker) seed sowed on humid filter paper in a Petri dish.

# Multi-scale assays: microphenotyping

Image from Quiévreux *et al.* (2021)

- Field crop phenotyping and drone imaging ;
- Hydroponic cultures and plants in pots phenotyping ;
- Germination tests in Petri dishes ;
- RSA\* and rhizosphere acidification analysis on *Arabidopsis thaliana*...



*Arabidopsis thaliana* (var. Col-0) seedlings grown on nutritive gelose in phytostrips.

\* Root system architecture.

# After multi-scale assays, what's next?

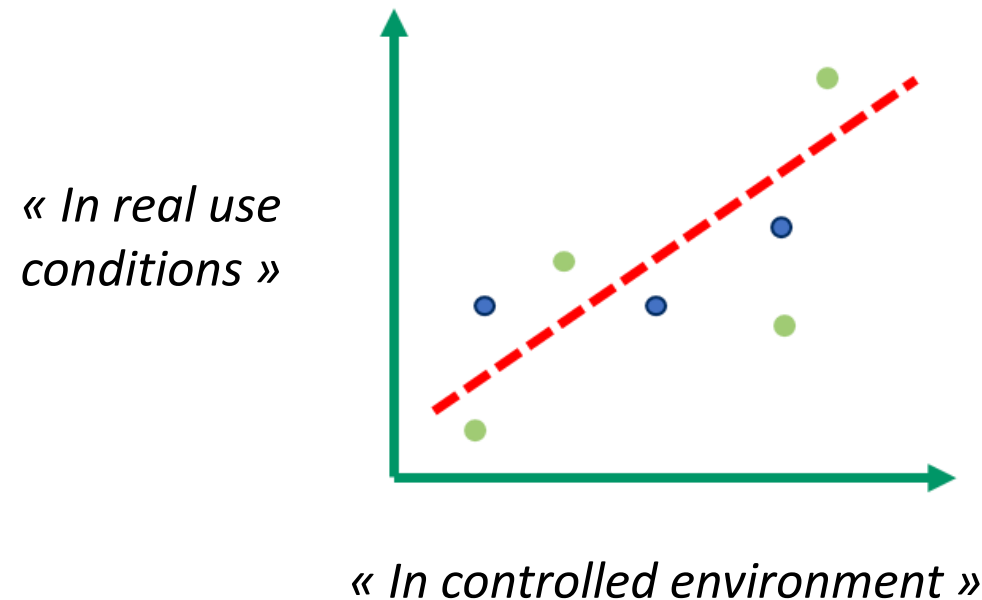
- Plant phenotyping ;
- Drone imaging ;
- Germination tests ;
- *In vitro* cultures ;
- Biochemical analyses...



⇒ **To generate parallel datasets with the same commercial products.**

# Meta-analysis for correlation identification

Results of laboratory and greenhouse bioassays are compared with field crop performance through correlation analyses.



⇒ Identification of the protocol(s) predictive of success in crop field.

# Expected deliverable : a useful screening tool

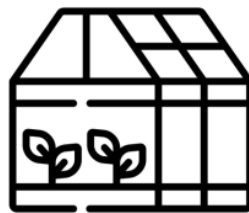
Predictive protocols before setting up field trials for biostimulant development.

If positive result(s) in  
controlled environment...



Laboratory

and/or



Greenhouse

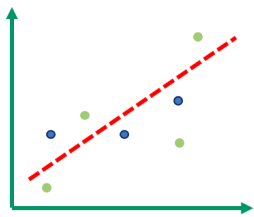
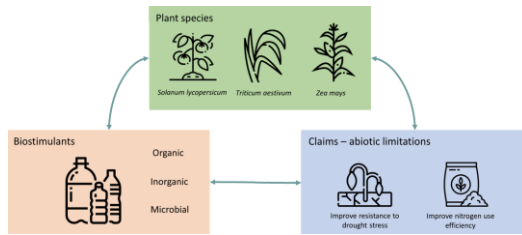


Design of bespoke field  
trials with expected  
crop performance !



Field

# Take home message(s)



Efficacy proven in R&D.



Field trials with expected efficacy.



Application in real use conditions



- 1) Multi-scale assays to generate parallel datasets.
- 2) Meta-analysis (correlation between datasets).
- 3) Development of a screening tool before field trials.
- 4) Establish an evaluation platform in Belgium.

# Acknowledgements



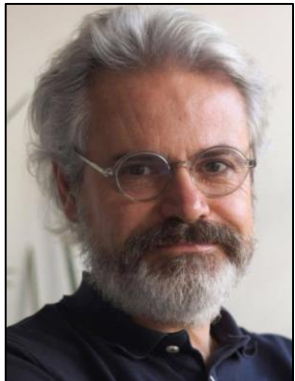
International Conference  
**SABB** | Sustainable Agriculture  
Biostimulants & Biopesticides  
September 20-22, 2022 - Ghent, Belgium

- This project is funded by the Walloon Region and by Redebel sa.
- Project collaborators present at this congress :

Avec le soutien de  
la



**Wallonie**



Pr. Patrick du Jardin  
(GABT-ULiège)



Sébastien Dumont de  
Chassart (Redebel sa)



Ir. William Falesse  
(Redebel sa)



PhD. Salomé Lengrand  
(UCLouvain)

- Other collaborators :  
Dr. Pierre Delaplace (GABT-ULiège)  
Tanguy D. de Chassart (Redebel sa)  
Dr. Benjamin Dieryck (Redebel sa)  
Pr. Anne Legrève (UCLouvain)

- **TERRA Teaching and Research Center tour on Sept. 22<sup>nd</sup> (departure around 10:45am).**
- Contact : [martin.quievreux@uliege.be](mailto:martin.quievreux@uliege.be).