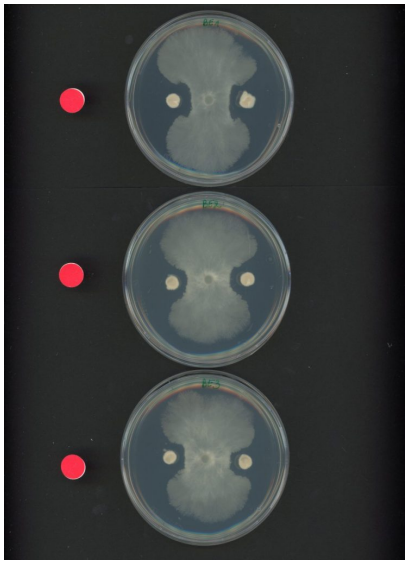
The need for sustainable alternatives in crop protection is more urgent than ever. “We study how plants defend themselves and how different pathogens manage to bypass those defences. In addition to understanding these mechanisms, we also explore nature-based solutions that can help strengthen plant immunity. Our long term goal is to identify strategies and traits that can be used to make crops more resistant to pathogen attacks,” says Professor Dr. Barbara De Coninck, who heads the Plant Health and Protection (PHP) Laboratory at KU Leuven.

While chemical control was an effective and indispensable method in the past – and to some extent will remain so – chemical crop protection products are under increasing pressure. This is, among other things, due to the emergence of resistant pathogens and negative effects on people and the environment. Possible solutions include the use of beneficial micro-organisms and/or resistant cultivars. Within the PHP Lab, the emphasis is on sustainable production of horticultural crops. The researchers are mainly looking at diseases in horticultural crops that are economically important in Flanders.



The PHP Lab-team. © PHP Lab



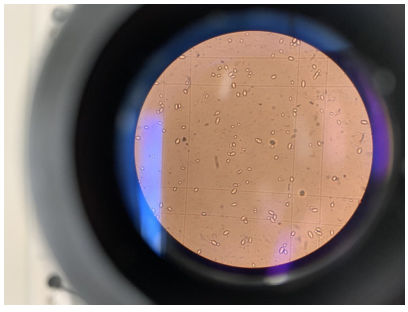
Beneficial microorganism inhibits pathogen growth. © Katto Macharis

New crops, new pathogens

“Such as tomatoes, strawberries and lettuce. But we also work with pears and even make a side trip to the cultivation of avocados in Vietnam. Thanks to the extensive banana collection of KU Leuven, we can also contribute to the fight against the worldwide threats to banana cultivation.” Recent research by the PHP lab concerns intensive hydroponic cultivation. “These have become increasingly important, but because they are relatively new applications, we also see the emergence of new pathogens.”

Plant pathogens have a major impact on plant growth, crop yield and quality. Plants have the ability to respond to these pathogens via an extensive arsenal of biomolecules and proteins. Their responses help plants to defend themselves against pathogens and prevent their colonization, growth and reproduction. “However, through co-evolution with their plant hosts, pathogens have also developed mechanisms to circumvent plant defences. Understanding the interaction between plant and pathogen is crucial for preventing infections and developing resistant cultivars, and requires further identification of the proteins and metabolites involved. In addition, the application of plant defence elicitors (PDEs) and beneficial microorganisms can reduce the reliance on chemical crop protection products, which are traditionally used to prevent yield losses due to pests and pathogens.”

“PDEs protect plants against diseases by stimulating induced resistance (IR), which strengthens the plant’s defence system, leading to a faster and more powerful response to infection. Beneficial micro-organisms can offer dual protection: they may directly inhibit pathogens through antimicrobial activity and simultaneously enhance plant immunity by triggering IR. However, the molecular basis of these processes still is insufficiently known,” says De Coninck.



Spores of Botrytis cinerea. © Katto Macharis



The susceptibility of strawberry against Botrytis cinerea depends on the strawberry ripening stage. © Yijie Zhao

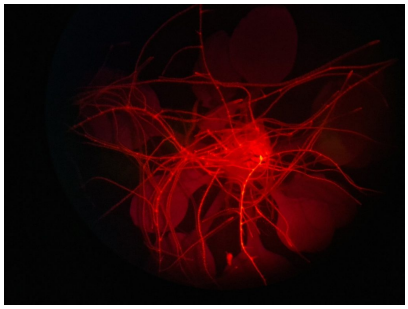
Fast growth

The PHP lab was founded in 2016 and quickly grew into a research group with, in addition to Barbara De Coninck herself, seven PhD students, three postdocs and a laboratory technician.

“In our lab, we investigate a wide range of beneficial microorganisms and their specialized metabolites as well as PDEs, including microalgae and plant extracts. We also conduct studies to unravel the mechanisms of action of these PDEs. Regarding research on plant defences, we are best known for our research on the interactions between *Agrobacterium rhizogenes* and plants – especially tomatoes – and that of *Botrytis cinerea* with strawberries.”

Sustainable and global

“We have all the necessary infrastructure for RNA and DNA research, the generation of transgenic plants and the identification and characterization of microorganisms. We are certified to work with plant pathogens under safe conditions. Our existing growth rooms are fully automated and in early 2026, we will be putting a new research greenhouse into operation to continue studying plant-pathogen interactions in more real-life conditions. It will run entirely on renewable energy and have quarantine compartments.” Internationally, the PHP Lab collaborates with, among others, Wageningen University & Research in the Netherlands, Stellenbosch University in South Africa, Purdue University in West Lafayette (USA) and Quy Nhon University in Vietnam.



Agrobacterium rhizogenes infected plants. © Savio Rodrigues

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