

Travel report from Plant BioProTech meeting, Rennes, France

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Headline bullet points:

- New environmentally friendly fungicides and bactericides based on lipopeptides (e.g. mycosubtilin) are in the final stages of production scale-up and product registration.
- The research of plant defence priming has finally reached field trial stages and the promising results were showcased on a range of crops.
- Now, biocontrol products based on *Trichoderma*, *Pythium* and others have reached the market and promise to aid the control of root and foliar diseases.
- Novel plant protection products based on extracts from waste plant material, as well as pure DNA and RNA extracts, have shown real promise and are in the registration pipelines in the EU.
- Since Brexit, the UK's unclear alignment with the EU's pesticide registration framework is reducing product registration in the UK, resulting in UK farmers having fewer new plant protection products than their EU counterparts.

The Plant BioProTech conference is a unique event focused on research and application of new sustainable pest and pathogen control agents in horticulture and agriculture. The event brings together researchers from academia and industry, engineers involved in production of agrochemicals, end users from agriculture and horticulture, and legislators from Europe and the rest of the world. The 2022 edition of the Plant BioProTech conference was attended by more than 600 delegates presenting all aspects of plant protection research, from the hot off the press laboratory scale breakthroughs through to patenting, product development, field trials and registration challenges. The programme covered control of diseases of most horticultural and agricultural crops with a main focus on: biocontrol organisms, induction of plant defences with elicitors, production and testing of new bioactive compounds, and the problems and potential solutions to bridging the research to market gap.

Lipopeptides are a very exciting new class of antimicrobials with a broad range of activity. Bacterial lipopeptides, and particularly those produced by strains of *Bacillus subtilis*, have been the subject of a great deal of scientific research over the past few years and are now in the field trial and registration stages in many EU countries. Their biological activities include

biosurfactant, antitumoral, antimicrobial, antifungal and plant defence stimulation. Philippe Jacques (INRA, Fr) presented research on one of the most well studied lipopeptides, mycosubtilin. It showed good control of downy mildew (*Bremia lactucae*) on lettuce, and *Septoria* leaf blotch (*Zymoseptoria tritici*) on wheat and grey mould (*Botrytis cinerea*) on tomato in glasshouse trials. Lipopeptide combinations worked well in field conditions against apple scab (*Venturia inaequalis*) on apple, downy mildew on lettuce and grey mould on tomato. Lipopeptide antimicrobial activity is primarily due to disruption of cell membranes, to which pathogens are less likely to develop resistance. Researchers and production company LIPOFABRIK (Fr) have also demonstrated low toxicity, low ecotoxicity and high biodegradability of their products. The first biostimulant from LIPOFABRIK, with a positive effect on yield and defence induction but minimal mycosubtilin content, should be available on the EU market in 2023. Plant protection products with high mycosubtilin content should soon follow.

In contrast to standard plant protection products that aim to inactivate pests and pathogens, plant defence inducers aim to enhance crop defences which in turn reduce the impact of pest and pathogens with minimal undesired effects on the environment. The pioneer in the field of plant defence induction, Uwe Conrath (Aachen University) has outlined the difference between plant defence enhancers and elicitors. Enhancers permanently increase defences such as secondary metabolite production and can cause a yield penalty as a result. Elicitors, on the other hand, only very transiently increase defences upon application, but activate stronger and longer lasting defences upon subsequent pathogen attack. Uwe presented how elicitors have so far shown versatile positive effects in research set-ups, protecting against insect herbivory, fungi, bacteria and viruses. Most of the discussions were on their latest research such as the molecular pathways, receptors and plant hormones involved in systemin based defence eliciting. New discoveries were presented, such as where plants treated with pure DNA extracts sourced from the same plant species increased defence against a wide range of pests and pathogens with no yield penalty (L. Rassizadeh, Universitat Jaume I). Water extracts from cucurbits were shown to protect rice and tomato against nematodes by directly killing nematodes and eliciting plant defences (E. Degroote, Ghent University). Translation in the field was also shown, for example the research on validation of elicitors in glasshouse grown tomato and lettuce (C. Verly, Staphyt), and the combination of the biocontrol yeast (*Aureobasidium pullulans*) with the elicitor acibenzolar-S-methyl for control of bacterial canker on kiwi (H de Jong, Plant & Food research).

The sessions I found most interesting were on new biocontrol agents, alternative plant protection products and current barriers in transferring research outputs into products available to growers and advisors. Research

and development of a wide range of new biocontrol products was showcased. *Trichoderma atroviride* SC1, known in the UK as Vintec (Belchim), was shown to control brown rot (*Monilinia laxa*) on stone fruit, grapevine trunk diseases such as Esca and *Eutypa* dieback, and stalk and petiole infection with *Botrytis cinerea* in glasshouse tomato production (A. Nessler, Bi-Pa). Similarly, BIOBesticide, a *Pythium oligandrum* based biocontrol product, was shown to be very effective against grapevine trunk diseases. Tri-Soil (Agrauxine), a biocontrol product based on the *Trichoderma atroviride* strain I-1237, is now registered in the EU to control *Pythium sp.* on carrot and *Rhizoctonia solani* on lettuce through spatial and nutritive competition, antibiosis and mycoparasitism, even at very low soil temperatures. Interestingly, the soil residing arbuscular mycorrhizal fungus *Rhizophagus irregularis*, which helps plants to obtain water and nutrients, also induced resistance against spider mites in citrus and is thus a potential new way to reduce the impact of climate change-induced pest pressure. One of the more remarkable talks on biocontrol in field conditions was the research presented by C. Da Cunha Maia (University of Reims). She has clearly shown that different biocontrol strains (*B. subtilis* PTA-271 and *T. atroviride* SC1) have very different disease control capabilities on different grapevine cultivars. The efficacy was also dependant on whether the biocontrol strains were applied alone or in combination. This shows the complexity of cultivar and microbiome knowledge required for effective biocontrol in field conditions.

The French company Antofenol have developed an innovative product called Antoferine, made by extracting natural anthocyanins from waste grapevine cuttings. The product has shown great potential for control of apple scab (*Venturia inaequalis*). Similarly, hop (*Humulus lupulus*) extracts are in the development pipeline to control *Botrytis cinerea* on tomato.

From the point of UK food production, there was one very worrying and recurring theme emerging from group and one to one discussions: the effect of Brexit on availability of new products in the UK. The vast majority of new products and active ingredients encountered in the Plant BioProTech meeting were in different stages of registration in the EU. When asked if and when the products will be available in the UK, the industry answers were mainly, 'we don't know'. The problem seems to be that it is still unclear how well aligned UK and EU legislation will be in the post-Brexit world and if there will be reciprocity in recognition of registered products. If reciprocity cannot be reached, then the UK's relatively small market size and extra costs of registration will deter most producers from entering the UK market. As a consequence, UK food producers will have access to much fewer new products than their EU counterparts. Worse still, research done in the UK may be commercialised sooner in the EU than the UK, due to a larger market

and new, potentially simplified legislation regarding biocontrol being discussed in the EU.

My attendance of the Plant BioProTech meeting was a truly transformative and eye opening experience. I have met and discussed various challenges of sustainable plant protection with upcoming and established researchers from Europe and the rest of the world. This has highlighted to me some national and global issues in research and development, legislation and commercialisation of novel plant protection products. The obtained knowledge will be crucial in my further research career and even more for potential translation of research outputs into commercially viable products. I am confident that cutting edge biocontrol and sustainable plant protection research presented in this meeting will help me to develop better research projects in the future. Importantly, the huge amount of information I gathered on the commercialisation strategies, registration, marketing and testing involved in the transition from lab to field application will help me to prepare a better case for rapid commercialisation of future research outputs.

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Conference costs, £ 1,177.74. Receipts attached as separate files.:

- Train Kent – London: £35
- Train London - Reims return: £270.79
- Taxi Strood – Larkfield: £35
- Conference Fees: EUR 660.00
- 3x meal during the conference: EUR 16.80, 21.40, 24.00
- Hotel in Reims, € 198.45