ISPP INTERNATIONAL SOCIETY FOR PLANT PATHOLOGY

PROMOTING WORLD-WIDE PLANT HEALTH AND FOOD SECURITY

INTERNATIONAL SOCIETY FOR PLANT PATHOLOGY

ISPP NEWSLETTER

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Editor: Daniel Hüberli (**email**)

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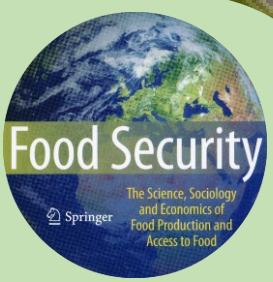


JUNE UPDATE ON ISPP RESILIENCE BURSARY FOR PLANT PATHOLOGISTS

By the time you are reading this, it will be over 100 days since the invasion of Ukraine leading to the death of thousands and displacement of millions of civilians, and the destruction of homes, industries, infrastructure and agricultural crops and enterprises.

Ukraine is the breadbasket of the world and the more than 200 plant pathologists who live and work there are contributing vital R and D to benefit national and international crop protection. With these issues in mind as well as recognising possible future needs in other parts of the world, the ISPP has launched the ISPP Resilience Bursary Fund for Plant Pathologists.

The ISPP is currently working closely with the Polish Phytopathological Society/ Polskie Towarzystwo Fitopatologiczne (PPS) to provide support for Ukraine plant pathology researchers who are arriving as refugees in Poland (Figure 1). The PPS Commission for Cooperation (Figure 2) is overseeing the bursary awards and activities as well as assisting with follow-on placements, with each intern preparing regular reports on their activities.

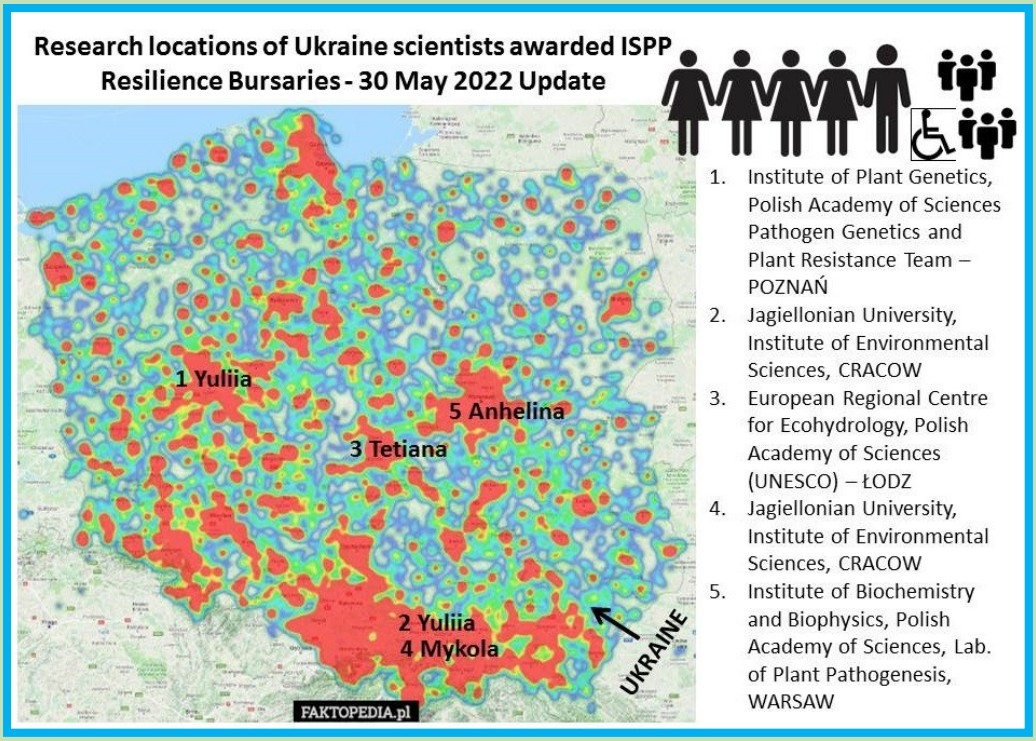


Figure 1. The location in Poland of recipients of ISPP Resilience Bursaries– 30 May 2022. The colour shading shows the locations of refugees arriving since 24 February 2022, with red showing the highest density of arrivals (cities) and blue the lowest density (extending to almost every village). Numbers are lowest near the Eastern border (except border crossings).

Figure 2. Members of the Polish Phytopathological Society Commission of Co-operation. Clockwise from top left Małgorzata Mańka – Chair, Zbigniew Karolewski – Treasurer, Wojciech Wakuliński – Vice-Chair, Dorota Szopińska – Secretary and Malgorzata Jędryczka – Vice-Chair.

In the May 2022 issue of the ISPP Newsletter, we reported the awarding of bursaries to 3 phytopathologists and the anticipated arrival of others. Since then, two of the three have received additional 3 months internship each from the Polish Academy of Sciences jointly with National Academy of United States and one has been awarded the internship of the Kosciuszko Foundation. Moreover, one of the awardees will continue her scientific career participating the research project in Spain. On top of this additional two scientists have been awarded ISPP bursaries. The new recipients are:

- Anhelina from D.K. Zabolotny Institute of Microbiology and Virology National Academy of Sciences, Kyiv, Ukraine, now working at the Institute of Biochemistry and Biophysics, Polish Academy of Sciences, Lab. of Plant Pathogenesis, Warsaw and
- Mykola from the Department of Optimizing Man-made Landscapes, Kryvyi Rih Botanical Garden of National Academy of Sciences of Ukraine. Mykola is the father of a disabled child and he is initially working in a small town near Cracow and after wards will work in a laboratory of the Jagiellonian University in Cracow.

Figure 3. New recipients of Resilience Bursaries - Mykola from Kryvyi Rih and Anhelina from Kyiv.

The research activities of the first 3 bursary recipients are as follows.

YULIA KOBYRENKO – Participation in two projects funded by the Polish Ministry of Agriculture and Rural Development – one concerned with identifying genes related to pea (*Pisum*) resistance to ascochyta blight and one on resistance of oilseed rape plants to diseases caused by fungi and protists.

YULIA KORZH – Study of the microbiota of a *Chlorella sorokiniana* culture (obtained from the University of Göttingen). This is part of a project assessing the interaction of algae with endophytes that can stimulate growth and protect algal cells from pathogenic bacteria and fungi.

TETIANA MAMENKO – Analysis and summarizing of experimental data obtained in Ukraine on fungicidal seed treatments in combination with rhizobia inoculant to increase disease and enhance nitrogen uptake in soybeans under drought conditions.

The first three ISPP interns have submitted presentations (jointly with Polish researchers) for the conference of the Polish Phytopathological Society on 7-8 September 2022. One will be presented by a Professor from Poland as an oral presentation (with joint participation of ISPP intern as a part of the research group) and two other presentations will be as posters. One poster will be on the research the ISPP intern had undertaken in Ukraine, which she summarised and concluded in Poland, and the other is a part of the research project in Poland funded by the Ministry of Agriculture and Rural Development.

All who are involved in the awards are immensely grateful to the Societies and individuals who have provided support to date. The ISPP also recognises that some societies may not feel that donations to the bursary scheme fit within their Society's mandate or constitution. If this is the case for your Society, perhaps consider taking up a collection from individual members or organising an event to raise funds. At least one Society has taken this approach so far!

Once again if you or your Society wishes to donate, here are the details. Credit card payment link for additional donations to the Fundraising Campaign for the ISPP Resilience Bursary is below.

PayPal™ Donate Now

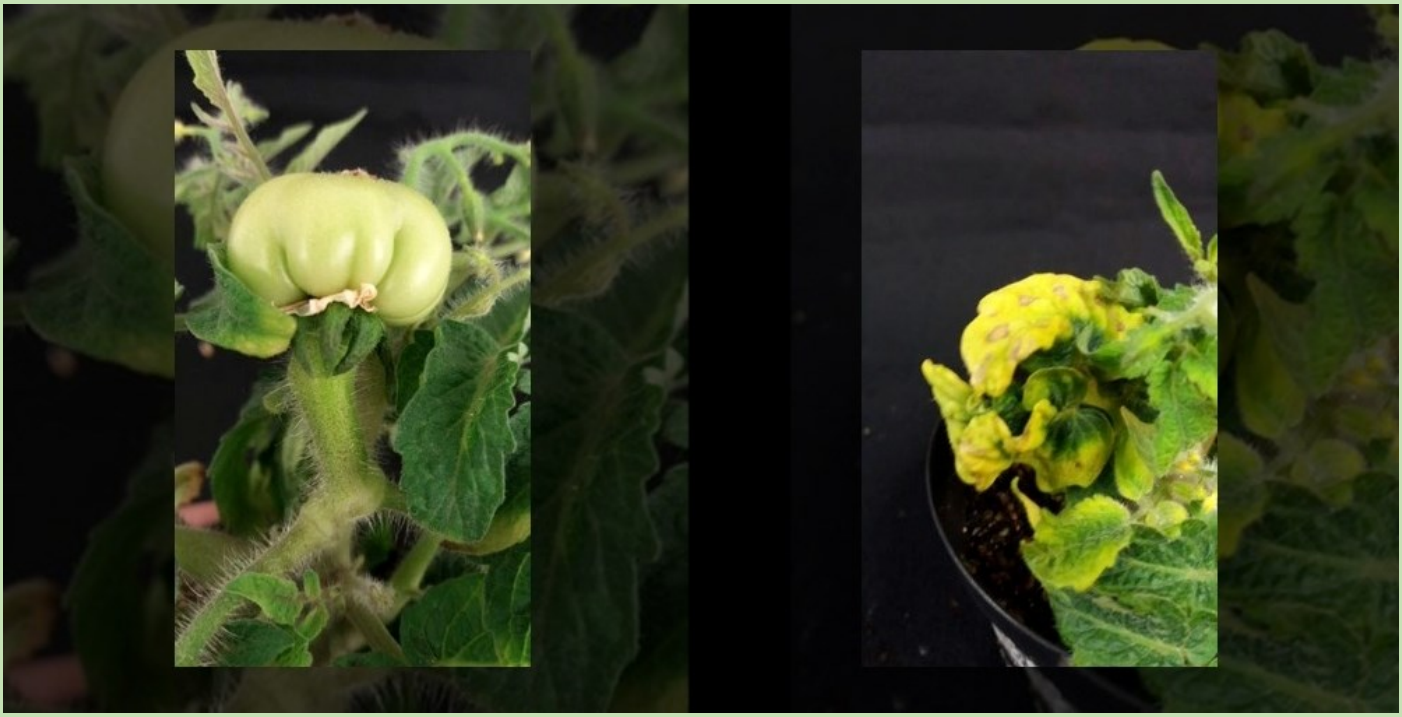
Funds can also be provided as a check or bank wire to ISPP. Please communicate with resilience@isppweb.org to get specific information. The donation will be considered a gift to this program and is tax deductible in the U.S.

If you have any concerns or queries about the bursary fund please email us at resilience@isppweb.org. If you are aware of plant pathologists in need arriving in other countries please help us to connect.

Jan Leach, President, ISPP
Greg Johnson, Immediate Past President, ISPP
Mathews Paret, Treasurer, ISPP
Małgorzata Mańka, President, Polish Phytopathological Society & ISPP Councillor
Małgorzata Jędryczka, ISPP Councillor for PPS

FUNGUS INDUCES ABNORMAL GROWTH OF COCOA TREES AND THEN FEEDS ON DEAD TISSUE

JOSÉ TADEU ARANTES, AGÊNCIA FAPESP NEWS, 18 MAY 2022



Micro-Tom tomatoes infected by Moniliophthora perniciosa. This small fast-growing plant is also susceptible to attack by the fungus and was used by the researchers as a plant model to investigate the process that leads cocoa trees to develop witch's broom (Photo credit: Daniele Paschoal/CENA-USP).

The action mechanism of the fungus *Moniliophthora perniciosa*, which causes witch's broom disease in cocoa trees, with major losses for Brazilian producers, is being increasingly elucidated. In an article published in the *Journal of Experimental Botany*, researchers at the University of São Paulo's Center for Nuclear Energy in Agriculture (CENA-USP) in Brazil report that the pathogen makes trees grow excessively, draining their energy, and that when they die, it colonises dead cells and feeds on the accumulated lignin.

Previous research by the same group showed that the fungus synthesizes cytokinin, which alters the plant's hormone balance and leads to excessive growth of infected tissue, competing with fruit production and root growth, and exhausting the plant via a mechanism similar to cancer (more at: https://agencia.fapesp.br/36824).

Now the group has discovered that infection occurs in two stages. The fungus first releases cytokinin and makes the tree produce lignin, its favorite food. In the second, the fungus consumes the lignin. "There are two kinds of plant pathogen: biotrophic, feeding on living tissue, and necrotrophic, feeding on dead tissue. There's also a hybrid class called hemibiotrophic, which initially infects living cells and then parasitizes dead cells at a later stage. *M. perniciosa* belongs to this hybrid class," said agricultural engineer Antônio Figueira, a professor at CENA-USP and principal investigator for the research project.

According to Figueira, the fungus's biotrophic phase is much longer than normal, lasting 30-45 days. During this phase, spores germinate and give rise to a specific, thicker and more irregular mycelium, which grows between the host cells without entering them. The latest study by the researchers demonstrated that this hypergrowth drains the host plant's energy, reducing the number and weight of its fruit as well as its root biomass. All this happens without an increase in fungal mycelium production.

"Tissue death occurs in the next phase of the disease when mycelium enters the cells and grows significantly. This mycelium is morphologically distinct, thin and linear, and colonizes all the dead tissue. After a time, mushroom production begins," Figueira said.

Researchers had long wondered why the fungus appears not to benefit from colonising the plant and causing so many symptoms. The new study provides answers.

"We discovered that during the initial phase, the plant hormone cytokinin released by the fungus makes the infected plant produce a great deal of vascular tissue so that secondary cell walls accumulate lignin, on which the fungus feeds after the plant's tissue is dead," he explained.

The species closest to *M. perniciosa* are all saprotrophic, meaning they feed on dead tissue and other organic detritus. The fungus that causes witch's broom has apparently evolved to be capable of infecting living tissue, modifying its metabolism to promote the synthesis of lignin, its favorite food, and establishing a foothold in the plant before tissue death occurs. "This gives *M. perniciosa* a clear advantage over competing fungi," Figueira said.

COCOA CRISIS

Witch's broom disease was first described in 1919, but it was apparently confined to Amazonia in the North region of Brazil until the late 1980s when it spread to southern Bahia in the Northeast region. Brazil was then the second-largest cocoa grower, producing more than 400,000 metric tons per year. As a result of the disease, annual harvests had fallen to some 100,000 tons by 2000.

The industry is slowly recovering, but Bahia is no longer Brazil's foremost cocoa-growing state, having fallen behind Pará. In 2020 the national crop was still only 250,000 tons, ranking seventh in the world. The latest scientific research is highly promising for the development of novel crop management techniques.

AGROINNOVA CELEBRATES THE FIRST INTERNATIONAL DAY OF PLANT HEALTH (12TH MAY 2022)

BY ANDREA MASINO

Innovation and passion, projects, publications, and reaching out – keywords for Agroinnova, the Centre of Competence for the Innovation in the Agro-environmental Field at the University of Torino. On 12th May, the International Day of Plant Health (IDHP), Agroinnova opened its campus to the public.

In order to celebrate its 20th year of activity, Agroinnova hosted a special guest: Antonio Pascale, Italian writer and journalist, as well as an official inspector at the Ministry of Agriculture, Forestry and Food (MIPAAF). Pascale is also very active in scientific dissemination. His last book is "*La foglia di fico. Storie di alberi, donne, uomini*"(Einaudi publisher).

Maria Lodovica Gullino and Angelo Garibaldi welcomed the guests and introduced the writer's speech. Antonio Pascale ran through the key steps of Italian agricultural history and highlighted its profound need to innovate for the future; crucial topics on which Agroinnova has based its principles since the beginning.

The event, included in the cultural program of the Torino Book Fair, was organised with the collaboration of AgriNewTech, ANT NET and weTree.

After the visit, and a very tasty lunch on a sunny day, the guests left the Centre with the traditional gift of basil and ornamental sage pots, symbols of the applied research carried out by Agroinnova researchers.

NEW APP PROVIDES FERTILE GROUND FOR SOIL HEALTH KNOWLEDGE

THE UNIVERSITY OF WESTERN AUSTRALIA NEWS, 27 MAY 2022

The University of Western Australia's Emerita Professor Lynette Abbott has compacted more than five decades of soil biological health research into a new app. The SOILHEALTH app was funded by the Australian Government's National Landcare Program Smart Farms Small Grants to provide essential information about complex aspects of soil health in a digital format.

UWA Emerita Professor Lynette Abbott, Cheryl Rimmer and Alex LushImage: UWA Emerita Professor Lynette Abbott, Communications Officer Cheryl Rimmer and Alex Lush from Lush Digital (Photo credit: UWA).

The app is available to download for free on IOS and Android phones and tablets via Apple and Google Play. Features of the SOILHEALTH app include an eBook, podcasts, and seven soil health animations custom-created by Lush Digital.

Professor Abbott is a world-leading academic and science communicator in soil science and soil biology at the UWA School of Agriculture and Environment and The UWA Institute of Agriculture. Professor Abbott runs hands-on activities demonstrating the benefits of soil biota for soil health, and leads the Land Restoration Demonstration Site research project at UWA Farm Ridgefield in Pingelly.

Although Australian farmers are the main target audience, Professor Abbott said the SOILHEALTH app was a valuable resource for anyone interested in soil health, including teachers, students, and gardeners. "All in-app resources can be downloaded online, and then accessed offline," she said. "A farmer could take a break from harvesting to watch our animated video on 'Effects of soil disturbance on organisms' while out in the field, or perhaps tune in to a few podcast episodes from home."

Professor Abbott said UWA Farm Ridgefield researchers and staff assisted with the development of the eBook.

FUNCTION FOLLOWS FORM IN PLANT IMMUNITY

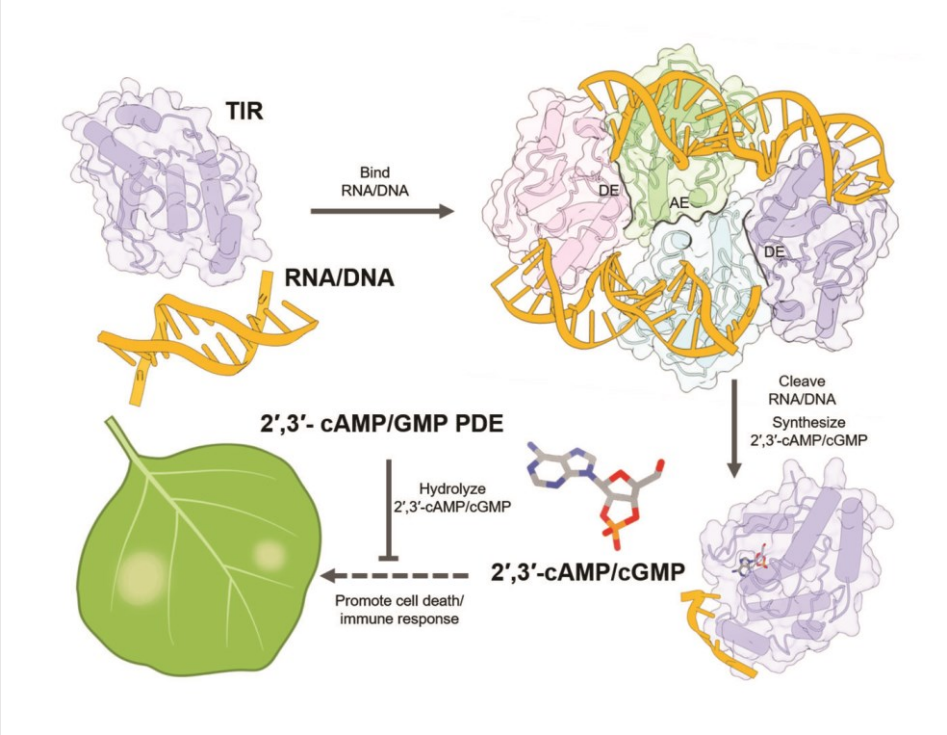
MAX PLANCK INSTITUTE NEWS, 20 MAY 2022

Scientists from the Max Planck Institute for Plant Breeding Research (MPIPZ) and the University of Cologne, Germany, have discovered a novel biochemical mechanism explaining how immune proteins defend plants against invading microorganisms. Their findings are published in the journal *Cell*.

We humans rely on our immune systems to protect us from diseases caused by harmful microorganisms. In a similar manner, plants also mount immune responses when invaded by harmful microbes. Key players in these plant immune responses are so-called immune receptors, which detect the presence of molecules delivered by foreign microorganisms and set in motion protective responses to repel the invaders.

A subset of these immune receptors harbours specialized regions known as toll-interleukin-1 receptor (TIR) domains and function as enzymes, special proteins that break down the molecule nicotinamide adenine dinucleotide (NAD+), a highly abundant, multi-functional small molecule found in all living cells. Breakdown of NAD+, in turn, activates additional immune proteins, ultimately culminating in the so-called "hypersensitive response", a protective mechanism that leads to the death of plant cells at sites of attempted infection as an effective way to protect the plant as whole. However, studies have shown that breakdown of NAD+, while essential, is not sufficient for plant protection, suggesting that additional mechanisms must be involved.

The authors, led by the corresponding authors, Jijie Chai, who is affiliated with the MPIPZ, the University of Cologne, and Tsinghua University in Beijing, China, Paul Schulze-Lefert from the MPIPZ, and Bin Wu from School of Biological Sciences, Nanyang Technological University, Singapore, examined the function of the TIR proteins and could show that these receptors not only broke down NAD+, but intriguingly possess an additional function – the TIR domains were also processing molecules with phosphodiester bonds, typically found in RNA and DNA, which are present in cells mainly as large, linear single- or double-stranded molecules. Using structural analysis, the authors could show that TIR proteins form different multi-protein structures for breakdown of NAD+ or RNA/DNA, explaining how one and the same protein can carry out two roles. To cleave the RNA/DNA molecules, the TIR proteins follow the contours of the RNA/DNA strands and wind tightly around them like pearls on a string. The ability of TIR proteins to form two alternative molecular complexes is a characteristic of the entire immune receptor family. The exact shape of the TIR proteins thus dictates the respective enzyme activity.



The authors went on to show that this function itself was not enough for cell death, suggesting that specific small molecules generated by the breakdown of RNA and DNA were responsible. Using analytical chemistry, the scientists could identify the molecules as cAMP/cGMP (cyclic adenosine monophosphate/cyclic guanosine monophosphate), so-called cyclic nucleotides that are present in all kingdoms of life. Intriguingly, rather than the well-characterized 3',5'-cAMP/cGMP, the authors analysis showed that the TIR domains were triggering the production of the so-called non-canonical 2',3'-cAMP/cGMP, enigmatic "cousins", whose precise roles have thus far been unclear. When they reduced TIR-mediated production of 2',3'-cAMP/cGMP, cell death activity was impaired, demonstrating that the 2',3'-cAMP/cGMP molecules are important for the plant immune response.

If 2',3'-cAMP/cGMP promote cell death in plants in response to infection, then it stands to reason that their levels would be kept tightly in check. Indeed, the authors discovered that a known negative regulator of TIR function in plants, NUDT7, acts by depleting 2',3'-cAMP/cGMP. Similar negative regulators are released by certain pathogenic microorganisms during infection inside plant cells, and the scientists could show that these pathogen proteins also deplete 2',3'-cAMP/cGMP. This suggests that invading microorganisms have evolved clever strategies to disarm the 2',3'-cAMP/cGMP-dependent plant defence mechanism for their own benefit.

Dongli Yu, one of three co-first authors of this study, together with Wen Song and Eddie Yong Jun Tan, sums up the significance of his study thus:

"We have identified a new role for the TIR domain of immune receptors in protecting plants against infection. Looking forward, identifying and characterizing the targets of 2',3'-cAMP/cGMP will suggest novel strategies for making plants more resistant to harmful microbes and in this way contribute to food security."

£2.4M LEGACY GIFT WILL FUND PHDS IN PLANT SCIENCES

UNIVERSITY OF ABERDEEN NEWS, 23 MAY 2022

APPLICATIONS have opened for four fully-funded PhD studentships in plant sciences thanks to a legacy gift of £2.4m to the University of Aberdeen Development Trust from alumni. The newly established Anthony and Margaret Johnston Centre for Doctoral Training (CDT) in plant sciences will initially support studentships in biodiversity and evolution, interactions and global change. The deadline for applications is 12 noon on June 13 and interviews will take place in early July. Further information on the studentships is available here.

Anthony and Margaret Johnston graduated from the university in 1943 and maintained a lifelong relationship with the university through the alumni relations team. Mr Johnston, a passionate mycologist and botanist, had an eminent international career in plant pathology, plant disease and plant protection, working for the UN and as director of the commonwealth mycology institute. Mrs Johnston sadly died in 2005 and her husband passed away in 2019 aged 98.

Director of the Interdisciplinary Centre for Environment Professor David Burslem said: "The University of Aberdeen is the only UK higher education institution to offer degrees in Plant and Soil Science. Our research and education in plant and soil science, ranging from fundamental explorations of global biodiversity to sustainable food production, has recently been awarded the Queen's Anniversary Prize, the highest honour for UK further and higher education.

"The newly established Anthony and Margaret Johnston Centre for Doctoral Training in Plant Sciences, made possible by a generous legacy gift from our alumni, will support successive cohorts of doctoral students to undertake training and research related to our core themes of Biodiversity and Evolution, Interactions and Global Change. We are delighted to have these four fully-funded studentships on offer that will give students the opportunity to be part of large and multi-disciplinary groups of award-winning staff who are active in plant and soil research."

Read more including a list of available projects.

INTERNATIONAL PHYTOBIOMES CONFERENCE 2022 – EARLY BIRD REGISTRATION

Early Bird registration closes on 24th June for the International Phytobiomes Conference. Don't miss this chance to save on your registration! Further information about the meeting is available on the website.

VINE REMOVAL TECHNIQUE FOILS DEVASTATING GRAPE DISEASE

JIM CATALANO, CORNELL CHRONICLE, 17 MAY 2022

Greg Loeb, professor of entomology, examines leafroll disease (Photo credit: Cornell AgriTech).

Removing not only a diseased grapevine but the two vines on either side of it can reduce the incidence of leafroll disease, a long-standing bane of vineyards around the world, Cornell researchers have found.

Leafroll disease, a virus spread by mealybugs, damages grapevines, reduces yield and alters grape quality – all of which can detrimentally affect wine quality and cost growers tens of thousands of dollars per hectare. There's no cure for leafroll disease, so growers have traditionally attacked it by tearing out infected vines – that is, roguing, or removing "rogue" plants – and replacing them with healthy ones.

In the first study of its kind, scientists at Cornell AgriTech have documented that the new technique, called spatial roguing, can reduce the incidence of leafroll disease in commercial vineyards. Removing the extra vines eliminates the mealybugs' means of transporting the leafroll virus, creating a moat-like space. The study was published in the *American Journal of Enology and Viticulture*.

For the study, Marc Fuchs, professor in the Plant Pathology and Plant-Microbe Biology Section in the School of Integrative Plant Science at Cornell AgriTech, and his team set up a cabernet franc plot at Sheldrake Point Winery in Ovid, New York, where they documented the presence of leafroll disease and mealybugs, and then tested the effectiveness of spatial roguing and mealybug insecticide management, both alone and in combination.

Over a five-year period, they found that spatial roguing was effective in quickly reducing the incidence of leafroll virus – from 4% in 2016 to almost zero in 2020-21 – while the unrogued vines' viral incidence increased from 5% to 16%. Insecticides reduced mealybug population to almost zero over the same period; in untreated vines, it grew 57 to 257 times greater. But insecticides were not shown to limit the number of newly infected vines.

"By acting quickly and utilising Fuchs' strategy, we now know that we will avoid having to remove large sections of vineyards in the future. That will translate into more consistent yields and quality, which are both critical to our winery's success," said Dave Wiemann, vineyard manager at Sheldrake Point Vineyard.

Fuchs has been researching grape viruses for decades and had been intrigued by the possibilities of spatial roguing. But it wasn't until 2015, when he collaborated with Miguel I. Gómez, the Robert G. Tobin Food Marketing Professor in the Charles H. Dyson School of Applied Economics and Management, and Shadi Atallah, Ph.D. '14, his graduate student at the time, that he was able to gather some numbers to bolster his case.

"They modeled what they are referring to as the bio-economic spread of the disease, where one takes into account how the disease is spreading in the vineyard and what the economics have been for the grower," Fuchs said. "Meaning, do you remove just one vine or also the two adjacent vines, and how much money do you make or lose? When is it economical to do one thing versus the other?"

There is a cost to spatial roguing, Fuchs said, in terms of the labor needed to removing disease vines and replanting with healthy vines, in addition to the loss of full production for the five years it takes a new vine to begin producing.

"Growers are used to making business decisions on how to best manage their vineyards based on immediate profits," he said. "But we are convinced that it's worth losing a little bit of money upfront, or investing money upfront, because dividends would be incurred much faster down the road."

Sometimes, leafroll infestation can be so high – a virus incidence of 25% or more – that it's not economical to employ spatial roguing. In those cases some growers will choose to do nothing and live with the reduced quality of their grapes, while others will determine that total vineyard replanting is the better strategy.

The concept of spatial roguing may puzzle some growers and winemakers, Fuchs said.

"Growers like to grow things, not tear them out," he said. But as more of them adopt the tactic, he believes the results will speak for themselves. "My strategy is to identify some early adopters and let them spread the word and convince their peers of the efficacy of the new methodology."

GENETIC OPTIONS ENSURE RUST RESISTANCE IS TOAST

KAUST DISCOVERY, 9 MAY 2022

Stem rust is a significant disease in wheat crops around the world, with outbreaks expected to become more common under future scenarios of climate change. The reemergence of the disease over the past few decades highlights the importance of developing new wheat varieties with broad-spectrum ongoing resistance to stem rust, says King Abdullah University of Science and Technology (KAUST) researcher Brande Wulff.

Professor Brande Wulff (pictured) collaborated with an international team to identify a stem rust resistance gene in a wild cereal relative of wheat, which they successfully transferred to common wheat (Photo credit: KAUST; Brande Wulff.).

An international research team, including Wulff and lead author Guotai Yu, have recently identified a stem rust resistance gene in *Aegilops sharonensis* and transferred it to common wheat. The new transgenic wheat lines show high levels of resistance to the stem rust pathogen. The work was recently published in Nature Communications.

So far, 58 stem rust resistance genes have been identified in wheat, with almost half of these introduced from wild and domesticated species of wheat and other cereals. *A. sharonensis* is a wild relative of wheat found in Israel and southern Lebanon. The species possesses many traits of agricultural importance, including resistance to major wheat diseases such as rust, but its genetic potential remains largely untapped.

"Advances in genomics and bioinformatics are fueling an exponential growth in the discovery and cloning of disease resistance genes in wheat and its wild relatives," says Yu. "This is providing exciting opportunities for engineering broad-spectrum and durable disease resistance into wheat."

Importantly, the team has published a "reference genome", which will support ongoing efforts to clone other resistance genes. "This means that most of the genome has been assembled into connecting stretches of DNA that, in turn, have been ordered according to their physical orientation in the genome," explains Wulff. This genome assembly will be useful in future studies aimed at cloning genes from *A. sharonensis*, understanding the evolution of wild grasses and domestication of wheat.

So far about 80 genes have been cloned in wheat, of which about 40 are disease-resistance genes and of these, 30 are resistant for the rusts (wheat stem rust, stripe rust and leaf rust). Wulff says that now the raw material is available to engineer some formidable stacks containing multiple resistance genes for each rust gene. "Such polygene stacks would be very difficult for the pathogen to overcome, potentially turning wheat into a nonhost for these devastating diseases," predicts Wulff.

"If I were a wheat rust now, I would be shaking in my spore."

HOW MICROCLIMATES DRIVE THE EPIDEMIOLOGICAL MECHANISMS OF COFFEE BERRY DISEASE

A paper by Natacha Motisi *et al.* titled "The dark side of shade: How microclimates drive the epidemiological mechanisms of Coffee Berry Disease" was published on 2 May 2022 by *Phytopathology* (vol. 112, pages pages 1235-1243). The abstract is as follows:-

Coffee berry disease (CBD) can cause significant coffee yield losses along with major income losses for African smallholders. Although these farmers cannot afford to purchase pesticides to control the disease, agroecological solutions have rarely been investigated, and how epidemiological mechanisms are linked to the environment of the coffee tree and the plot remains unclear. Agroforestry systems are a promising agroecological option, but the effect of shade on CBD regulation is the subject of debate, and the use of plant species diversity remains uncertain. Here, we address how shade affects epidemiological mechanisms by modifying the microclimate. For this purpose, we developed a mechanistic susceptible-exposed-infectious-removed model and used a Bayesian framework to infer the epidemiological parameters against microclimatic covariates. We show that shade has opposing effects on different epidemiological mechanisms. Specifically, shade can limit disease dynamics by reducing disease transmission while simultaneously promoting disease dynamics by reducing the latent period of the pathogen. However, in full sun, efficient disease transmission compensates for long latent periods. As a result, the balances between microclimatic variables can counterbalance the epidemiological rates, which can dramatically alter the fate of epidemics in shade versus full sun conditions. We propose research avenues to help design cost- and environmentally effective management strategies for CBD that are notably based on the functional traits of shade trees that could hamper CBD dispersal.

Read paper.

PHYLOTYPE DIVERSITY WITHIN SOIL FUNGAL FUNCTIONAL GROUPS DRIVES ECOSYSTEM STABILITY

A paper by Shengen Liu *et al.* titled "Phylotype diversity within soil fungal functional groups drives ecosystem stability" was published on 9 May 2022 by *Nature Ecology and Evolution*. The abstract is as follows:-

Soil fungi are fundamental to plant productivity, yet their influence on the temporal stability of global terrestrial ecosystems, and their capacity to buffer plant productivity against extreme drought events, remain uncertain. Here we combined three independent global field surveys of soil fungi with a satellite-derived temporal assessment of plant productivity, and report that phylotype richness within particular fungal functional groups drives the stability of terrestrial ecosystems. The richness of fungal decomposers was consistently and positively associated with ecosystem stability worldwide, while the opposite pattern was found for the richness of fungal plant pathogens, particularly in grasslands. We further demonstrated that the richness of soil decomposers was consistently positively linked with higher resistance of plant productivity in response to extreme drought events, while that of fungal plant pathogens showed a general negative relationship with plant productivity resilience/resistance patterns. Together, our work provides evidence supporting the critical role of soil fungal diversity to secure stable plant production over time in global ecosystems, and to buffer against extreme climate events.

Read paper.

NEPALI RESEARCHERS GET TRAINED ON RAPID DIAGNOSTICS TOOL AND GET READY TO MONITOR YELLOW RUST

CIMMYT NEWS, 12 MAY 2022

On 26-29 April 2022 researchers from Nepal participated in a workshop on the use of MARPLE Diagnostics, the most advanced genetic testing methodology for strain-level diagnostics of the deadly wheat yellow rust fungus. Scientists from the International Maize and Wheat Improvement Center (CIMMYT) and the John Innes Centre trained 21 researchers from the Nepal Agricultural Research Council (NARC) and one from iDE. The workshop took place at NARC's National Plant Pathology Research Centre in Khumaltar, outside the capital Kathmandu.

Diane Saunders (left), Group Leader at the John Innes Centre and project co-lead, observes workshop participants during the use of MARPLE (Photo credit: Danny Ward/John Innes Centre).

"The need for new diagnostic technologies like MARPLE and the critical timing of the workshop was highlighted by the severe yellow rust outbreak observed this season in the western areas of Nepal," commented Dave Hodson, Senior Scientist at CIMMYT and project co-lead. "Having national capacity to detect the increasing threats from yellow rust using MARPLE will be an important tool to help combat wheat rusts in Nepal". The yellow rust fungus can cause grain yield losses of 30–80 % to wheat, Nepal's third most important food crop.

Current diagnostic methods for wheat rust used in Nepal are slow, typically taking months between collecting the sample and final strain identification. They are also costly and reliant on sending samples overseas to highly specialised labs for analysis.

MARPLE (Mobile and Real-time PLant disEase) Diagnostics is the first method to place strain-level genetic diagnostics capability directly into the hands of Nepali researchers, generating data in-country in near-real time, for immediate integration into early warning systems and disease management decisions. "This is a fantastic opportunity to bring the latest innovations in plant disease diagnostics for the wheat rust pathogens to where they are needed most, in the hands of researchers in the field working tirelessly to combat these devastating diseases," commented Diane Saunders, Group Leader at the John Innes Centre and project co-lead.

Suraj Baidya senior scientist and chief of the National Plant Pathology Research Centre at NARC noted the worrying recent geographical expansion of yellow rust in Nepal. "Due to global warming, yellow rust has now moved into the plain and river basin area likely due to evolution of heat tolerant pathotypes. MARPLE Diagnostics now gives us the rapid diagnostics needed to help identify and manage these changes in the rust pathogen population diversity," he said.

The highly innovative MARPLE Diagnostics approach uses the hand-held MinION nanopore sequencer, built by Oxford Nanopore, to generate genetic data to type strains of the yellow rust fungus directly from field samples.

Beyond MARPLE Diagnostics, Saunders noted that "the workshop has also opened up exciting new possibilities for researchers in Nepal, by providing local genome-sequencing capacity that is currently absent."

Workshop participants stand for a group photo (Photo credit: Danny Ward/John Innes Centre).

WHAT'S NEXT FOR MARPLE DIAGNOSTICS IN NEPAL?

Following the successful workshop, Nepali researchers will be supported by CIMMYT and the John Innes Centre to undertake MARPLE Diagnostics on field samples collected by NARC. "The current plan includes monitoring of yellow rust on the summer wheat crop planted at high hill areas and then early sampling in the 2022/23 wheat season," Hodson noted.

"We were struck by the enthusiasm and dedication of our colleagues to embrace the potential offered by MARPLE Diagnostics. Looking forward, we are excited to continue working with our Nepali colleagues towards our united goal of embedding this methodology in their national surveillance program for wheat rusts," Saunders remarked.

CURRENT VACANCIES

No current vacancies.

ACKNOWLEDGEMENTS

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COMING EVENTS

New CONNECTIONS: plant pathology, entomology and the road ahead
28 June - 30 June, 2022
ONLINE and FREE
Website: www.connectedvirus.net/new-connections-conference/

Nanotechnology in Agriculture
30 June - 1 July, 2022
University of Tuscia, Viterbo, Italy
Contact: nanoagrischool22@unitus.it
Website: www.unitus.it/it/dipartimento/dafne/summer-school-/articolo/nanotechnology-in-agriculture

4th International *Erwinia* Workshop
2 July - 3 July, 2022
Assisi, Italy
Website: www.icppb2020.com

14th International Conference on Plant Pathogenic Bacteria
3 July - 8 July, 2022
Assisi, Italy
Website: www.icppb2020.com

12th International Workshop on Grapevine Trunk Diseases (ICGTD12)
11 July - 15 July, 2022
Mikulov, Czech Republic
Website: ucanr.edu/sites/ICGTD/Workshops_559/

11th Australasian Soilborne Diseases Symposium
1 August - 5 August, 2022
Cairns, Queensland, Australia
Website: asds2022.w.yrd.currinda.com

APS Plant Health 2022
6 August - 10 August, 2022
Pittsburgh, Pennsylvania, USA
Website: www.apsnet.org/meetings/annual/PH2022

Annual Oomycete Molecular Genetics Meeting
22 August - 25 August, 2022
Mendel University, Brno, Czech Republic
Website: omgn.org/

16th International Cereal Rusts and Powdery Mildews Conference
31 August - 2 September, 2022
University of Cambridge, UK
Website: www.niab.com/international-cereal-rusts-and-powdery-mildews-conference-2022

BSPP2022 – Microbial lifestyles: from symbionts to pathogens
5 September - 7 September, 2022
Newcastle University, UK
Website: www.bspp.org.uk/conferences/bspp2022/

International Phytobiomes Conference 2022
13 September - 15 September, 2022
Denver, Colorado, USA
Website: phytobiomesconference.org

1st International Plant Health Conference
21 September - 23 September, 2022
London, UK
Website: www.ippc.int/en/news/press-release-the-first-international-plant-health-conference/

8th International Cereal Nematodes Symposium
26 September - 29 September, 2022
Abant, Turkey
Website: www.cimmyt.org/events/8th-international-cereal-nematodes-symposium-icns/

13th Arab Congress of Plant Protection
16 October - 21 October, 2022
Le Royal Hotel, Hammamat, Tunisia
Contact: Dr. Asma Jajar, Chairperson of Organising Committee info@acpp-aspp.com
Website: acpp-aspp.com

13th International Congress on Plant Biotechnology and Agriculture
12 June - 16 June, 2023
Cayo Guillermo, Cuba
Website: bioveg.bioplantas.cu

12th International Congress of Plant Pathology (ICPP2023)
20 August - 25 August, 2023
Lyon, France
Website: www.icpp2023.org

XX International Plant Protection Congress
1 July - 5 July, 2024
Athens, Greece
Website: www.ippcathens2024.gr

9th ISHS International Postharvest Symposium
11 November – 15 November, 2024
Rotorua, New Zealand
Website: scienceevents.co.nz/postharvest2024

12th INTERNATIONAL CONGRESS ON PLANT PATHOLOGY

ICPP 2023

ONE HEALTH for all plants, crops and trees

LYON

20-25 August, France

www.icpp2023.org

ISPP INTERNATIONAL SOCIETY FOR PLANT PATHOLOGY

SFP Société Française de Phytopathologie

The International Society for Plant Pathology & the French Phytopathological Society

INTERNATIONAL SOCIETY FOR PLANT PATHOLOGY (ISPP)

WWW.ISPPWEB.ORG

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