INTERNATIONAL NEWSLETTER ON PLANT PATHOLOGY

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News and announcements on any aspect of Plant Pathology are invited for the Newsletter.
Contributions from the ISPP Executive,
Council and Subject Matter Committees, Associated Societies and Supporting Organisations are requested.

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In this issue:

Academician Nan Zhibiao wins CSPP's Lifetime Achievement Award

Academician Nan Zhibiao of LZU was honoured with a Lifetime Achievement Award by the Chinese Society for Plant Pathology (CSPP) at its annual academic conference which was held in Tai'an city of Shandong Province during 25-29 July, 2017. CSPP's director-general, Professor Peng Youliang of the China Agricultural University, awarded medals to prize winners. The prize was also awarded to academician Li Yu of the Jilin Agricultural University.

It is reported that CSPP's Lifetime Achievement Award, the top prize of plant pathology in China, was set by CSPP to honour Chinese scientists who have made a significant contribution to the development of China's plant pathology research. So far, the prize was awarded to academician Tian Bo, Zheng Ruyong, Fang Rongxiang of Chinese Academy of Sciences and academician Xie Lianhui of Fujian Agricultural and Forestry University.

(Lanzhou University News, 4 August 2017)

Professor Sophien Kamoun awarded the 2016 Kuwait Prize for Applied Science in Food and Agriculture

Professor Sophien Kamoun, Group Leader at The Sainsbury Laboratory, has been awarded the 2016 Kuwait Prize for Applied Science in Food and Agriculture by The Kuwait Foundation for Advancement of Sciences (KFAS): a government non-profit organisation whose aim is to promote progress and advancements in science and technology. The Kuwait Prize was launched in 1979 in line with the objectives of the KFAS: to support various branches of scientific research and to encourage Arab scientists and researchers.

The award was presented by the Director General Dr. Shihab-Eldin, during a ceremony at Bayan Palace presided by HH Sheikh Sabah Al-Ahmad Al-Jaber Al-Sabah, the Emir of Kuwait. The awards are presented annually with new categories each year.

Dr. Shihab-Eldin said that, ‘Prof. Kamoun’s accomplishments included his effective leadership in vegetable pathology research, particularly in the study of potato diseases, and in the successful production of microbial resistant species.’ The Kamoun group at TSL studies effector biology of filamentous plant pathogens, such as the blight-causing pathogen, *Phytophthora infestans*, which was responsible for the massive potato crop losses seen during the Great Famine in Ireland, and which continues to require extensive control through fungicide application.

Prof. Kamoun recently appeared in an episode of the BBC The Inquiry entitled ‘What Went Right in 2016’ where he discussed using a new technique that came of age in 2016 – gene editing. Discussing his research using gene editing on tomato crops, to decrease its susceptibility to a particular disease, Prof. Kamoun said, “Every year we lose enough food to feed hundreds of millions of people to pathogens and parasites. If we could make some of our crops more resilient, then that would be a unique achievement.”

(Sainsbury Laboratory News, 24 January 2017)

The international cereal rusts and powdery mildews conference 2018

Information on the next international cereal rusts and powdery mildews conference to be held in South Africa at the Kruger National Park during 23-26 September are now available on the website. Registration for the meeting are now open, and the closing date for submitting abstracts is 30 June 2018.

A discovery in the mountains could lead to big things for apple genetics

The origins of the modern apple lie with the world’s number one-producing nation of apples – China – and a particular strain of apple found on the eastern ridge of the Kazakhstani Tian Shan Mountains, where a team led by a professor from the Boyce Thompson Institute recently made a discovery that not only lead us to the origins of the modern apple, but could potentially unlock the keys to its future.

In August, the team of researchers led Plant Pathology and Plant-Microbe Biology professor Zhangjun Fei concluded a four year study of the genetic progression of apples in the region with a surprising discovery: the very origin of the domesticated apple, which begun as a small, mushy and tasteless breed that, traveling along the famed Silk Road, eventually laid the groundwork for the cultivation of boundless types of apple breeds the world over.

In their analysis of these species, the sequence revealed one thing in common: that every type of apple shared a common ancestor in the Malus sieversii, a wild apple native to Central Asia on the eastern side of the mountain range which, when bred with crab apples from western Europe, was allowed to evolve into the apple we know and love today – not too sweet, just tart enough and with a firm and crisp texture. This discovery – and the apple species that followed the route of the Silk Road both east and west, signifies a major breakthrough in plant biology as well as in the evolution of the apple: namely that now, plant scientists will have a common genome among all apples – those grown west and east of its point of origin – and will therefore be able to isolate certain traits of specific apples along each individual step of the breeding process.

Fei said there are two ways to modify the apple genome, affecting the phenotype: one way is through traditional means – the long way – and the other is through the use of genetic modification, artificial evolution, to improve one trait over another. Now armed with these new genetic markers to replace what was once all trial, error and earned knowledge scientists and breeders now have the ability to shorten that breeding cycle substantially without the need for the use of GMO technology.

Now with a common genome known amongst all types of apples, that process has great potential to not only be sped up, but for traits between cultivars to be immediately identifiable on a genetic scale. This could mean not only bigger or sweeter apples, but apples that last longer in storage, are hardier in the cold or resistant to changing conditions brought on by climate change.

https://youtu.be/xVq7k0CaG-o

Read more.

(Nick Reynolds, ithaca.com, 26 September 2017)

Partnership for Aflatoxin Control in Africa (PACA) Newsletters

Quarterly issued newsletters with updates and progress made in PACA pilot countries. The newest issue contains dedication of resources in Tanzania and Senegal, meeting youth opportunities in agriculture, and the strategy of food and nutrition security for Nigeria.

Newsletters can be downloaded in PDF format here.

“Pathogen hunters”: citizen scientists track plant diseases to save species

New plant disease epidemics are emerging all the time. Myrtle rust is an example of a disease recently identified in South Africa. It now threatens natural areas containing Myrtaceous plants and is of concern for many forestry industries growing Australian Eucalyptus species.

The emergence of new plant disease epidemics is largely driven by globalisation. Humans are the major pathway of spreading microbes that cause plant disease. But people are generally unaware of the risk and potential of their movement since the microbes in question are microscopic. The effect of plant disease could be reduced if people are made more aware of the many pathways for plant-killing microbes. That’s where citizen science projects, such as Cape Citizen Science, can help.

Cape Citizen Science facilitates research about Phytophthora species in South Africa’s Cape floristic region in the extreme south western tip of Africa. Many species of plants are threatened in this biodiversity hotspot, which is often recognised as the “hottest hotspot” because of the exceptional degree of endemism, housing thousands of species that don’t naturally occur anywhere else on the planet. But little is known about the impact of Phytophthora on Cape Flora. The project aims to create a baseline of data about Phytophthora species diversity and distribution.

Nearly 200 people have been involved as citizen scientists since the project launched in 2016. They contribute by reporting dying plants using the online tool Ispot Nature and submitting samples. Many reports and samples have come from areas that the researchers would not have found.

The project also offers workshops so citizens can learn to recognise and sample plant disease. Each workshop starts with a presentation about the research, incorporates a hike to find sick plants and ends with an activity to isolate and culture the microscopic organisms.

Citizen science projects have exceptional merit for the early detection of new plant disease epidemics. By incorporating many observers, more observations are made across space and time – and at a relatively low cost. And citizen science works: the Myrtle rust pathogen in South Africa was first discovered through a citizen’s report.

Although the work is regional, the model could be implemented on a larger scale and in other countries. Hopefully this project will serve as an example and a learning platform to help other research areas and other countries establish their own projects to involve more citizens.

(Joey Hulbert, The Conversation, 10 April 2017)

Hormonal tug-of-war helps plant roots navigate their journey through the soil

A sophisticated mechanism that allows plant roots to quickly respond to changes in soil conditions has been identified by an international research team. Scientists from the John Innes Centre and Sapienza University, Rome, combined mathematical and computer modelling with molecular genetics to show how roots can regulate their growth via the interactions of two antagonistic hormones, auxin and cytokinin. The findings are published in the paper "An auxin minimum triggers the developmental switch from cell division to cell differentiation in the Arabidopsis root" in Proceedings of the National Academy of Sciences.

As the root grows and meristem cells at the tip continuously divide, they are left behind in relation to the moving root tip. When these cells reach a certain distance from the tip, called the transition position, they stop dividing and instead start elongating until reaching their maximum lengths. But how do cells "know" when they have reached the transition position between division and elongation? What signal do they read out?

This, explains Dr Veronica Grieneisen of the John Innes Centre, is down to something called positional information, which is a common feature in all developing organisms: "Cells, although initially all identical, need to change fate or behaviour according to where they are located in the embryo or organ. This is positional information."

To solve the puzzle the teams of Dr Grieneisen and Dr Stan Marée from the John Innes Centre needed to discover what "positional information" is available at the transition zone to enable cells to know they are at the right location to transit behaviour from dividing (meristem zone) to elongating (elongation zone), and how this information is established and positioned.

Read more.

(Phys.org, 22 August 2017)

New and novel technologies successfully demonstrated in soilborne disease study

Sudden Death Syndrome (SDS), a prominent soilborne disease of soybean, can be devastating. Yield losses from SDS can reach 100%, depending on the soybean variety affected and stage of development when symptoms appear.   In a new Phytobiomes journal article, titled "Unraveling microbial and edaphic factors affecting the development of Sudden Death Syndrome in soybean," Srour, et al. show the scientific community a new way of analysing the soil to determine the incidence and the severity of SDS: by profiling not only the soil's physical and chemical properties, but the soil's microbes.

"The occurrence of SDS in fields is dependent on physical and biological factors, and the suppressiveness of soils to disease is a long-known phenomenon," said Dr. Ahmad Fakhoury, Associate Professor at Southern Illinois University and corresponding author of the article. "Promoting and sustaining the soil's natural suppressiveness to disease can be integral to the effective, sustainable management of soilborne pathogens."

Through these samples, Srour et al. studied the role of soil microbial communities, as well as the soil samples' physical and chemical properties in relation to SDS development. They measured multiple soil-related factors and used markers specific to bacteria, fungi, archaea, oomycetes, and nematodes coupled with sequencing, to identify key taxa likely associated with SDS development. They found significant differences in the bacterial and fungal community structures between healthy and diseased areas of fields, suggesting the relative abundance of multiple microbial taxa in the soil is a key determinant in the incidence of SDS.

"The work presented in this article, documents the first attempt to assess the importance of biological factors in determining the incidence of SDS in soybean using metagenomic tools," said Fakhoury. Fakhoury says their novel approach and research techniques are important in several other ways:

- These techniques can be used to indicate the 'health' of the soil and its ability to sustain *Fusarium virguliforme*, the main fungal pathogen that causes SDS.
- Others can build on this research to further characterise the role of species affecting *F. virguliforme* and to study the biology of their interactions.
- Similar techniques can be used to study other soilborne pathogens and diseases in the quest for their efficient and sustainable management.

"The emerging tools and techniques we used permit the differentiation of complex microbial interactions," said Fakhoury. "This will ultimately allow us to devise and adopt more efficient and sustainable strategies to manage SDS and other diseases that are detrimental to agricultural production."

(Phys.org News, 31 July 2017)

Controlling rice blight in developing countries

Rice blight caused by the bacterial pathogen *Xanthomonas oryzae oryzae* is a dreaded plant disease that endangers rice harvests throughout the whole of South-East Asia, especially India, as well as large parts of Africa.

Professor Wolf B. Frommer, plant researcher at the Institute of Molecular Physiology at Heinrich Heine University in Germany, has assembled an international research group to fight rice blight. The team includes scientists from Iowa State University and the University of Florida in the USA, the Institut de Recherche pour le Développement in Montpellier in France, Colombia's International Centre for Tropical Agriculture, and the International Rice Research Institute in the Philippines. The researchers have found a way to make plants resistant to the pathogen.

Frommer is an expert on transport processes in plants. The sugar transporters known as SWEET identified by his research group play a key role in resistance. Plants need these transporters to bring the sugar produced during photosynthesis in the leaves to the seeds. It is this transport mechanism that the pathogens re-programme for their own purposes.

In independent studies, American researchers Professor Bing Yang and Professor Frank White (Iowa State University and the University of Florida) discovered that a protein (which later transpired to be SWEET) is responsible for plants' resistance to rice blight. Joint trials then revealed that the bacteria systematically activate the transporters in the rice cells and in so doing gain access to nutrients. If such activation is prevented, the bacteria cannot multiply. Wolf B. Frommer says: "This surprising discovery has provided us with a strategy for our joint research project: We cut off the pathogens' route to their larder - the plants' sugar stores - and starve them out."

The research project "Transformative strategy for controlling rice disease in developing countries" began on 1 August 2017. The project is supported by a four-year grant from the Bill and Melinda Gates Foundation. In the framework of the project, Frommer will concentrate especially on the production of elite varieties for India and Africa. He will mostly conduct his research work within the working group led by Dr. Joon Seob Eom at the Max Planck Institute for Plant Breeding Research in Cologne.

The research results can prove valuable beyond the specific topic of rice blight. Wolf B. Frommer: "Our discovery might be just the tip of the iceberg. We could use the same approach to try and combat other plant diseases and in that way hopefully make a small contribution to protecting the world's food supply." And that would also be good for the climate and the environment, since if plant diseases can be combatted effectively, less pesticides and fertilisers would be needed worldwide to ensure sufficient harvests.

(EurekAlert, 10 August 2017)

Continental controls needed to maintain fightback against tree diseases

Tighter controls on timber and plant movements into Europe are necessary to prevent further disastrous effects of plant diseases, a new study of the ash-dieback pathogen advises. The call to action follows detailed investigations carried out in British woodlands into the population makeup of the *Hymenoscyphus fraxineus* fungus that causes ash dieback. While the findings bring some hope for the future of ash tree populations in Great Britain and continental Europe, the authors warn that further introductions of variants of the fungus from its native East Asia must be prevented.

Professor James Brown from the John Innes Centre, one of the authors of the peer review paper in the journal Plant Pathology, said: "What this study shows is that once the ash dieback fungus arrived in Europe, it spread to Britain both by wind-borne spores and by trade in plants. Other alien diseases could spread in the same way. Because of this, disease control must operate on a European scale. Above all, we should prevent diseased plants getting into Europe."

The genetic diversity found in European populations of the fungus had been transferred to all the British woodlands, whether they had been introduced as windborne spores or on imported nursery stock. This genetic diversity is, surprisingly, a positive sign for the future of ash because it allows natural selection to operate within populations of the fungus. The pathogen is expected to gradually evolve over successive life cycles to adapt to the tree rather than killing it.

This study has implications for timber and plant trade within Europe, "We have to be more rigorous about trade between European countries once it is known that a disease is in the source country. It would not stop spread of the disease but it would certainly slow it down," says Professor Brown.

Read more.

(EurekAlert, 28 September 2017)

Aerial Dispersal of Pollen and Spores - new book

Aerial Dispersal of Pollen and Spores. 2017. Donald E. Aylor. APS Press, 418 p.

Pollen and spore dispersal through the wind causes some of the greatest challenges in science and agriculture. It fosters the spread of yield-robbing plant diseases, and it causes cross-pollination of genetically modified (GM) crops with non-GM species just to name two.

A new book from APS PRESS, titled Aerial Dispersal of Pollen and Spores, helps users mitigate these and other issues by providing the latest science about the many complex factors and effects encompassing the movement of spores through the air. This unique and comprehensive treatise synthesises material scattered across the literature of multiple disciplines into one single place and adds many insights through new research in this important area of study.

Aerial Dispersal of Pollen and Spores covers dozens of topics within the study of pollen and spore dispersal, such as the physical properties, forces, and processes affecting pollen and spores—in motion and at rest; pollen and spore survival; infection and fertilisation efficiency; wind and wind transport models; cross fertilisation; pollen mediated gene flow; precision agriculture practices applied to aerially dispersed pathogens; infectious periods and opportunity for disease spread; aerial sampling, and more.

This cutting-edge book emphasises the critical, interacting biophysical processes that control the dispersal of particles in the atmosphere. By shining a greater light on these biophysical processes, users get many new and valuable perspectives that can be applied to their research and to understanding models behind the spread of pathogens and genetic material in the atmosphere.

This book is particularly useful to researchers, graduate students, and advanced undergraduates in the fields of plant pathology, plant biology, meteorology, agronomy, and agricultural engineering. It can also serve as a textbook or supplemental class reading for a number of disciplines, including plant pathology, botany, and aerobiology.

Aerial Dispersal of Pollen and Spores can also be used professionally. With this book:

- Researchers and practitioners can evaluate the relative importance of nearby and faraway sources of inoculum.
- Breeders can assess the outcrossing of potential and pollen mediated gene flow (PMGF) in the environment.
- Botanists can evaluate the physical characteristics of pollen and spores.
- Plant biologists can access information typically assessable only to physicists, leading to the undertaking of more quality interdisciplinary studies.

Visit http://www.shopapspress.org to learn more about this and other titles from APS Press.

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