INTERNATIONAL NEWSLETTER ON PLANT PATHOLOGY

ISPP Newsletter 47 (9) September 2017

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:

Update on the International Congress of Plant Pathology ICPP2018 Boston USA 29 July to 3 August 2018

With less than a year away from the next International Congress of Plant Pathology, planning is speeding up!

- The call for ICPP2018 travel bursaries closed on 31 August 2017
- An exciting range of topics for the Plenary (http://www.icpp2018.org/program/Pages/Plenary-Sessions.aspx) and Keynote sessions (http://www.icpp2018.org/program/Pages/Tuesday.aspx) is planned.
- It is anticipated that the open call for poster paper submissions will occur in late September of early October 2017. Check the website regularly: http://www.icpp2018.org
- An update and invitation to ICPP2018 from PhytoNews June 12017 can be accessed here

History of Plant Pathology at ICPP2018

As part of the celebration of the 50th anniversary of the International Society for Plant Pathology which was established at the first International Congress of Plant Pathology held in London UK in 1968, a concurrent session on the History of Plant Pathology has been planned for ICPP2018. In addition to the invited papers in the session, the organisers would like to encourage plant pathology societies and individual plant pathologists to submit poster paper abstracts on aspects of the history of pant pathology. This could be the history of a society, a particular discipline, an ISPP Subject matter Committee or a focus on an individual pioneering scientist. So get your thinking caps out!

If the History of Plant Pathology is a topic that interests you, and you would like to join a mailing list on the topic please email Greg Johnson (gregh4d@gmail.com).

Conference Networking 1O1

For first time conference attendees, and even old-timers, there's always more to learn. At the American

Phytopathology Society Meeting Annual meeting this year, Carolee Bull of Penn State University gave a flash presentation on networking for first time attendees. You can read about her advice and tips on how to get most from a meeting here: https://bullpennblog.wordpress.com/2017/08/13/aps-networking-101/

Asian Conference on Plant Pathology (ACPP) Translation from genome to disease management

The sixth Asian Conference on Plant Pathology will be held at the International Convention Center, Jeju, South Korea from 13-16 September 2017. There's a broad line up of plenary and keynote speakers and the conference will feature Country Reports for the first time. http://www.acpp2017.org/speakers.php

New grant to catalogue species of the genus Fusarium

David Geiser and Seogchan Kang, professors of plant pathology and environmental biology in Penn State's College of Agricultural Sciences, USA, received a $1.2 million grant from the National Science Foundation to perform the first new synthesis of taxonomy for species of the genus Fusarium in the past 30 years.

The genus represents several hundred species, each of which can affect plants and animals in different ways, or not at all. One species may cause blight on wheat and barley, a potentially billion-dollar problem for the industry, while another species may be used as a biological control to inhibit the growth of pathogenic microbes safely and affordably. Due to their vast diversity, varied characteristics and difficulties in differentiating them, providing effective means for accurate identification of Fusarium species is beneficial for public health, business and industry.

Geiser and Kang's project will produce a new monograph - a detailed and comprehensive work of writing on a single topic - of the Fusarium genus. The monograph will provide a complete description of all currently known species and utilise new and existing gene sequence data as molecular fingerprints. It also will include introductory chapters that summarise the biological and ecological diversity of the genus.

The project is international in scope, with participants at USDA's Agricultural Research Service; the National Agriculture and Food Research Organization in Tsukuba Science City, Ibaraki, Japan; Agriculture and Agri-Food Canada, in Ottawa; and the Westerdijk Fungal Biodiversity Institute in Utrecht, Netherlands, with other international participants anticipated to join in the future. The project will train two doctoral students and a postdoctoral scholar, broaden the training of the primary investigators and facilitate global collaborations between diverse scientists.

Read more.

(Emily Bartlett, Penn State News, 2 August 2017)

New techniques to pinpoint evolution in fungi

Researchers from Yale and Michigan State University have found a successful new strategy for pinpointing genes responsible for the evolution of certain biological processes published in PLOS Genetics in the July 13 issue.

To better understand the effects of genes on the evolution of an organism, large teams of biologists previously have worked to "knock out" - or turn off - thousands to tens of thousands of genes within the genome, seeing if they can perceive an effect that the gene knock-out has on the organism. However, this new work demonstrates a more precise shortcut for researchers: If they first identify identical genes present across different species that have increased in gene expression during their recent evolutionary development, the scientists can "knock out" this smaller targeted set to reveal genes underlying an organism's phenotype.

This discovery has important implications for efficiently discovering the genetic basis of evolved traits, including desirable traits in agriculture and animal husbandry and undesirable traits in invasive species and in plant, animal, and human pathogens.

(Kendall Teare, Yale News, 13 July 2017)

Induced defences in plants reduce herbivory by increasing cannibalism

A paper by John Orrock et al. titled "Induced defences in plants reduce herbivory by increasing cannibalism" was published in July 2017 by Nature Ecology and Evolution (vol. 1 pp. 1205-1207). The abstract is as follows:-

Plants are attacked by myriad herbivores, and many plants exhibit anti-herbivore defences. We tested the hypothesis that induced defences benefit tomato plants by encouraging insects to eat other members of their species. We found that defences that promote cannibalism benefit tomatoes in two ways: cannibalism directly reduces herbivore abundance, and cannibals eat significantly less plant material. This previously unknown means of defence may alter plant–herbivore dynamics, plant evolution and pathogen transmission.

Read paper.

Agricultural Microbiomes Project

A recent grant from the National Science Foundation (NSF) to Professor Linda Kinkel at the University of Minnesota College of Food, Agricultural and Natural Resource Sciences will create an international network, Agricultural Microbiomes Project (AMP), working on plant-associated microbes.

AMP participants will develop a coordinated global network of scientists, research sites, and model cropping and plant systems focused on agricultural plant endophytic and soil microbes. This will lead to better understanding of plant microbiomes and their relationships to plant productivity and sustainable crop production. AMP research coordination network participants will be key players in this work and its promotion.

The grant, which will support needed staffing, national workshops, and scholarships for students and underrepresented groups, will clear the way for researchers and educators to leverage existing research while building connections and partnerships between microbiome researchers and others in critical related fields such as systems biology, geographic information systems, evolutionary biology, and synthetic biology.

“Soils and plants support complex microbiomes composed of bacteria, fungi, and viruses. All of these have significant impacts on agricultural productivity,” Kinkel explained. “The more we know about this ‘new frontier,’ the better we will be able to harness microbes to enhance sustainable production of food, feed, and fibre to support an anticipated global population of nearly 10 billion by 2050.”

https://youtu.be/dZNuMOTPJ88

(University of Minnesota News, 18 July 2017)

Leaf litter microbiome of healthy adults protects cacao seedlings from *Phytophthora palmivora*

Scientists at the Smithsonian Tropical Research Institute (STRI) in Panama found that exposing cacao seedlings to microbes from healthy adult cacao plants reduced the plant's chance of becoming infected with the serious cacao pathogen, *Phytophthora palmivora*, by half. *Phytophthora palmivora* accounts for 10 to 20 percent of the loss in cacao production worldwide. The researchers' study was published in Proceedings of the Royal Society B on 5 July.

Researchers at STRI have investigated the interactions between plants and their microbes for the past 20 years. They were the first to show that in tropical forests, where cacao grows, every leaf is home to hundreds of different fungi and bacteria, and that applying helpful microbes to leaves in field treatments protected cacao from disease. Researchers found that specific fungal species, such as Colletotrichum tropicale, protect plants from pathogens and insects. Research at STRI has also shown that, as with humans, microbes stimulate plants' ability to defend themselves and has demonstrated the magnitude and extent of endophyte effects on host genetic expression.

"Not only did this show us that starting seedlings out surrounded by leaves from healthy adults may vastly

improve their health-a result potentially very important to the cacao industry-for the first time, we are beginning to understand how microbial communities assemble on leaves of cacao and other species in nature and what may influence their ability to protect plants," said STRI scientist and co-author, Allen Herre.

Read more.

(Phys.org, 7 July 2017)

Report of *Phyllosticta* spp. from citrus in Europe

A paper by V. Guarnaccia et al. titled " First report of *Phyllosticta citricarpa* and description of two new species, *P. paracapitalensis* and *P. paracitricarpa*, from citrus in Europe" was published in June 2017 by Studies in Mycology (vol. 87 pp. 161-185). The abstract is as follows:-

The genus *Phyllosticta* occurs worldwide, and contains numerous plant pathogenic, endophytic and saprobic species. *Phyllosticta citricarpa* is the causal agent of Citrus Black Spot disease (CBS), affecting fruits and leaves of several citrus hosts (Rutaceae), and can also be isolated from asymptomatic citrus tissues. Citrus Black Spot occurs in citrus-growing regions with warm summer rainfall climates, but is absent in countries of the European Union (EU). *Phyllosticta capitalensis* is morphologically similar to P. citricarpa, but is a non-pathogenic endophyte, commonly isolated from citrus leaves and fruits and a wide range of other hosts, and is known to occur in Europe. To determine which *Phyllosticta* spp. occur within citrus growing regions of EU countries, several surveys were conducted (2015–2017) in the major citrus production areas of Greece, Italy, Malta, Portugal and Spain to collect both living plant material and leaf litter in commercial nurseries, orchards, gardens, backyards and plant collections. A total of 64 *Phyllosticta* isolates were obtained from citrus in Europe, of which 52 were included in a multi-locus (ITS, actA, tef1, gapdh, LSU and rpb2 genes) DNA dataset. Two isolates from Florida (USA), three isolates from China, and several reference strains from Australia, South Africa and South America were included in the overall 99 isolate dataset. Based on the data obtained, two known species were identified, namely *P. capitalensis* (from asymptomatic living leaves of Citrus spp.) in Greece, Italy, Malta, Portugal and Spain, and *P. citricarpa* (from leaf litter of *C. sinensis* and *C. limon*) in Italy, Malta and Portugal. Moreover, two new species were described, namely *P. paracapitalensis* (from asymptomatic living leaves of Citrus spp.) in Italy and Spain, and *P. paracitricarpa* (from leaf litter of *C. limon*) in Greece. On a genotypic level, isolates of *P. citricarpa* populations from Italy and Malta (MAT1-2-1) represented a single clone, and those from Portugal (MAT1-1-1) another. Isolates of *P. citricarpa* and *P. paracitricarpa* were able to induce atypical lesions (necrosis) in artificially inoculated mature sweet orange fruit, while *P. capitalensis* and *P. paracapitalensis* induced no lesions. The *Phyllosticta* species recovered were not found to be widespread, and were not associated with disease symptoms, indicating that the fungi persisted over time, but did not cause disease.

Read paper.

Planthoppers' potential to control future crop virus outbreaks

Researchers from the Chinese Academy of Sciences' Institute of Zoology have discovered how Rice Stripe Virus (RSV) reproduces inside the small brown planthopper, a major vector of the virus. The virus causes major damage to rice crops each year. The study could inform future strategies for controlling the spread of this and other viruses that can lead to devastating effects on rice, wheat, cotton and other crops.

Viral infections in animal hosts activate a pathway by which a type of enzyme, called c-Jun N-terminal kinase (JNK), is signalled to respond. But how exactly viruses regulate this pathway in vectors remains an open question, and Cui says the answer would provide important clues for intervening in the spread of plant viruses. To address this question, Cui and her team explored the effect of RSV on the JNK signalling pathway in the small brown planthopper. Studying interactions between proteins, and using an analytical method to determine the compounds that are important for the JNK signalling pathway, they found that the virus activates the pathway in various ways - especially through the interaction of a planthopper protein called G protein pathway suppressor 2 (GPS2), and a viral protein called capsid protein.

Read more.

(Phys.org, 18 July 2017)

How virus resistance works in GMOs

Biology Fortified published a new infographic developed by Alma Laney, Layla Katiraee and team to help explain how virus resistance is created in genetically engineered crops. The GMOs Revealed infographic on Virus Resistance distills a lot of information about how to engineer this trait into plants, with papayas and squash as the current examples on the market. There is really a lot more to this issue than these two examples, so there is also a detailed overview explaining the challenges that farmers face with viral plant diseases, methods of control, and approaches to engineering resistance. Read the blog article.

(Biology Fortified, 29 July 2017)

Development of powdery mildew resistant tomato via CRISPR-Cas9

In tomato, there are sixteen Mlo genes, with SlMlo1 being the major contributor to the susceptibility to the powdery mildew caused by *Oidium neolycopersici*. Natural loss-of-function slmlo1 mutants are available in tomato, however, introgression of such mutations is a lengthy process. The team of Vladimir Nekrasov from the Sainsbury Laboratory, Norwich Research Park in the UK aimed to generate a transgene-free genetically edited slmlo1 tomato using the CRISPR-Cas9 system.

The team targeted the SlMlo1 locus using the double sgRNA strategy. Transformants were analyaed and eight out of ten tested T0 transformants indicated the presence of mutations. Assays using the powdery mildew fungus revealed that all the generated T0 slmlo1 mutant plants were resistant to the pathogen, while wild-type plants were susceptible.

Furthermore, the slmlo1 mutant plants were morphologically similar to the wild type and also produced harvested fruit weight similar to the wild types. The team named the generated variety Tomelo. This study presents evidence for CRISPR-Cas9 being a highly precise tool for genome editing in tomato.

Read paper.

(International Service for the Acquisation of Agri-Biotech Applications, Crop Biotech Update, 12 July 2017)

Acknowledgements

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