

Dear AMS Member,

This year has been speeding along and it's crazy to think that we're well into the second semester already. Here in New Zealand at the Manawatu Massey Campus we've had weather from all seasons: frosts, rain but also a reasonable amount of sunshine! The return of students for their new semester was followed by the early bloom of cherry blossoms across campus. Looking at these beautiful trees, it's hard not to be excited for spring, and any new mushrooms that you might see popping up.

In this newsletter we have a particular focus on plant pathogens, with some interesting research from Dr Melissa Guo on the plant pathogen *Phytophthora agathidicida*, which is a serious threat to kauri in NZ. While this pathogen is technically an oomycete rather than a fungus, we hope you find it just as interesting! Also, don't forget about our fantastic seminar series which has been running all year with great success. We have a great couple of speakers lined up for the next few months. Zoom links are available on our website, so make sure to tune in!

Some other important news: Annual General Meeting is coming up at the end of the year, with dates to be confirmed, but this is most likely to be in October. We'll send out a separate update with the details soon. Also, we'd like to give a belated congratulations to Prof Wieland Meyer for his [appointment as Associate Dean at Curtin Medical School](#), Curtin University, Perth, where he will be in charge of all research aspects of the Medical School. We wish Wieland well as he aims to set up many new collaborative opportunities for mycology in WA and Australia wide.

Take care,
Ellie Bradley and Hannah McCarthy

Australasian Mycological Society Student Representatives
Website: <https://www.australasianmycologicalsociety.com/>
Facebook: [AMSstudents](#) and Twitter: [@ausmycsoc](#)

AMS Virtual Seminar Series

Our seminars occur on the last Wednesday of the month at 12:00 pm AEST unless otherwise notified. Talks are 30 minutes long and are followed by 15 minutes of questions from the audience. To see upcoming seminars, and to register your attendance directly via Zoom, please visit our website <https://www.australasianmycologicalsociety.com/virtual-seminars-jul-dec-2021>.

25th August: *Natural history of blue entolomas, from Japan and the world*



Dr Kentaro Hosaka

National Museum of Nature and Science, Japan

Among various colours of mushrooms, blue is arguably the most striking and mysterious colour. The genus *Entoloma* is known to contain many colourful species, and *E. virescens* and a few others produce strikingly blue fruit bodies. *E. virescens* is the earliest blue entolomatoid species described in the genus. The holotype collection was made in 1854 from "the Bonin Islands" in Japan. Since then, dozens of Japanese mycologists have visited the islands, but mysteriously, no additional collections of *E. virescens* were

made for more than 100 years. From 2009, however, my colleagues and I have consistently collected *E. virescens* from the islands almost every year. I will discuss the potential reasons for this trend, based on literature and specimen data of *E. virescens* and related blue *Entoloma* species from the Bonin Islands, mainland of Japan, and other parts of the world.

29th September: *Looking in the cupboard: the hidden diversity of microfungi in Australia*



Dr Yu Pei Tan

Queensland Department of Agriculture and Fisheries

Australia's history of biological collection began when Joseph Banks visited Australia as part of James Cook's expedition in 1770. Following Banks, Australia's scientists and natural historians built the foundation of Australia's collections of algae, fish, insects, plants, mammals, birds, fungi, and microorganisms. The Queensland Plant Pathology Herbarium (BRIP) was established at the Federation of Australia. Its unique collection of Queensland microfungi dates back to 1850s. The specimens in BRIP include

microfungi that cause or are associated with diseases on plants or on insects, and from the environment (e.g. air, soil, phylloplane). Specimens collected in the past were identified based on morphology and/or host association. Using DNA sequence-based methods to examine the specimens kept in the "cupboard" of BRIP has uncovered a hidden diversity of undescribed species. The discovery of cryptic species and species complexes has implications for Australia's biodiversity and biosecurity.

Feature Research - The role of RXLR effectors during *Phytophthora agathidicida* infection

Dr Melissa Guo

Postdoctoral fellow, Plant pathology
Massey University
Palmerston North, New Zealand



Phytophthora agathidicida is an oomycete pathogen belonging to the *Phytophthora* 'plant killer' genus. Identified in New Zealand, *P. agathidicida* is most well-known for its ability to infect, and eventually kill, kauri, a native gymnosperm of cultural and ecological significance. In 2018, primarily as a consequence of the spread and effect of *P. agathidicida*, kauri were placed on the list of threatened species for the first time.

To investigate how this pathogen interacts with its host on a molecular level, we studied the role that pathogen effectors, such as RXLRs, play during infection. RXLRs are intracellular effectors present in some oomycetes, such as *P. agathidicida*, which are produced by the pathogen upon infection, and may target host molecules to manipulate the immune response (Wang and Jiao, 2019). Some of these effectors are recognised by specific plant receptors to elicit a defence response that can include localised plant cell death.

In total, 78 well-supported RXLRs were identified in the *P. agathidicida* genome. Of these RXLRs, 75 were cloned and screened on the model plant *Nicotiana benthamiana* for their ability to trigger a cell death response, via an *Agrobacterium tumefaciens*-mediated transient transformation assay. The use of *N. benthamiana* for screening in this study is not only due to the time, growth, and space requirements of kauri, but also out of respect for the cultural importance of this taonga (treasure) species. Furthermore, *N. benthamiana* is a well-established system that allows high throughput screening, and for which the genome information is available. As a result of this experiment, two of the 75 *P. agathidicida* RXLRs were found to elicit a cell death response in *N. benthamiana*. This

suggested that plant immune receptors which recognize those two RXLR effectors may be present in *N. benthamiana*, and that recognition of those two RXLR effectors triggers a downstream plant immune response, such as programmed cell death. Notably, one of the two RXLRs which triggered cell death in *N. benthamiana*, RXLR24, was also found to be an ortholog to the known RXLR effector Avh238 in *Phytophthora sojae* and is also very highly expressed by *P. agathidicida* when growing in kauri leaves and roots.

In addition to screening for *P. agathidicida* RXLRs that elicited a cell death response, we also screened for possible virulence functions. Could any of the 75 RXLRs suppress the plant immune response triggered by a cell death elicitor? Using a well-known *P. infestans* RXLR Avr3a as a cell death elicitor, in the presence of its potato immune receptor protein R3a, we investigated whether any of the 75 *P. agathidicida* RXLRs were able to suppress the resultant cell death response. Consequently, we identified one *P. agathidicida* RXLR, RXLR40, which could consistently suppress the cell death response triggered by *P. infestans* Avr3a/R3a.

Ultimately, the aim of this research is to better understand the role of these effector molecules during pathogen infection of the host, and thus to identify molecular markers for future resistance breeding in gymnosperm trees.

Wang W, Jiao F. Effectors of Phytophthora pathogens are powerful weapons for manipulating host immunity. *Planta*. 2019 Aug;250(2):413-425. doi: 10.1007/s00425-019-03219-x. Epub 2019 Jun 26. PMID: 31243548.

To read more about this research, check out:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7411639/pdf/MPP-21-1131.pdf>

To learn more about the oomycete plant pathogen *Phytophthora agathidicida*, check out:

<https://bsppjournals.onlinelibrary.wiley.com/doi/epdf/10.1111/ppa.13104>

Upcoming Mycology Events – Announcements and Changes

Eurosoil 2021 (Online)

Organisers: European Confederation of Soil Science Societies and local organizers.

23 – 27 August, 2021 | [Website](#)



The objective of Eurosoil 2021 is to bring together, in a safe online space, leading research scientists working on soil related topics and stakeholders dealing with issues of public concern, such as soil degradation and consequences of climatic changes. The important bridging role of soil practitioners to translate scientific knowledge into practice will be emphasised during the virtual edition of Eurosoil 2021.

16th Congress of the Federation of Asian and Oceanian Biochemists and Molecular Biologists



Organisers: FAOMB and NZMS online and In-person

22 – 25 November, 2021 | [Website](#)

Joint with the New Zealand Microbiology Society, session topics will include biotechnology; protein structure and function; molecular microbiology; industrial microbiology; gene regulation and signal transduction, genetics and genomics; the molecular basis of disease (including plant pathology); and plant biology, mycology and biochemistry.

Australasian Plant Pathology Conference (Online)



Organisers: APPS
23 – 26 November, 2021 | [Website](#)

We welcome the Australasian plant pathology community to what will be both the 23rd Biennial Australasian Plant Pathology Society Conference and our 1st fully online conference! This event was originally planned to be held in Hobart, Tasmania, however, due to the potential for ongoing impacts from COVID-19, we have decided to hold a fully online conference.

JAMS10: 10th Annual Joint Academic Microbiology Symposium (Online)

Organisers: JAMS
23-24 August, 2021 | [Website](#)



To celebrate 10 years of excellent scientific social gatherings, JAMS is holding its 10th Annual Symposium (JAMS10) on August 23rd and 24th 2021. This online event will unite all JAMS nodes in a specifically designed virtual conference centre known as “JAMS Town”. Prominent microbiologists will be featured as speakers, alongside posters (with prizes!) and networking sessions that will form part of an exciting meeting agenda to celebrate microbiology, life and JAMS. There is still time to register! Website above.

2021 Australian Biosecurity Symposium (Gold Coast, Queensland)



Organisers: The Biosecurity Collective | [Website](#)
1-2 December 2021

Animal Health Australia, the Invasive Species Council, the Centre for Invasive Species Solutions and Plant Health Australia are excited to host the 2021 Australian Biosecurity Symposium. This will once again focus on biosecurity prevention and provide the opportunity to share research and innovation, explore outside-of-the-box thinking and exchange knowledge and ideas across the biosecurity collective – agriculture (animals and plants), pest animals, weeds, wildlife, aquatics, humans, and the environment. This year’s theme is ‘a decade of biosecurity: turning a moment into a movement.’

Asian Mycology Congress AMC 2021 (Online)

Organisers: BIOTEC, the Faculty of Science, Prince of Songkla University, School of Science, Walailak University, Thailand Mycological Association, Thai Medical Mycology Forum, and Thailand Convention and Exhibition Bureau
15 – 17 December, 2021 | [Website](#)



AMC 2021 will be a virtual conference for speakers and presenters. It has been more than a decade since the AMC was held in Thailand. The theme of the congress is Asian Mycology in the 21st century: the new generation, and we will focus on the young generation of mycologists who will be at the forefront of Mycology in the future. The congress will cover a wide range of topics from basic science (taxonomy, ecology, pathology) to the applied aspects (biological control, biotechnology, genomics, metabolomics). The conference fee is only NZD \$54 or AUD \$ 50.

18th International Symposium on Microbial Ecology



Organisers: International Society for Microbial Ecology
21-26 August, 2022 | [Website](#) | Cape Town, South Africa

ISME18 is the 18th edition of our non-profit symposium which takes place every two years. The conference is the front runner in the field of microbial ecology, with an average of around 1,750 international scientists that attend the conference.

ISME-20 will be held in Auckland in August 2026

ESA2021: 61st Annual Conference of the Ecological Society of Australia (Now Online)



Organisers: ESA
22-26 November | [Website](#)

In 2021 the Conference theme is 'Renewal'. In a post-covid, post-black summer world, at ESA2021 we will explore a renewal in our relationships with each other and with nature, as our land recovers from fire, drought and flood. In light of the current COVID-19 situation in Australia and associated travel restrictions we have made the decision to move ESA2021 online. This will enable the conference to be accessible to as many people as possible and best reflect the breadth and depth of work being conducted on Australian ecology.



IMC12

Given the alarming development of the pandemic in various regions of the world, and subsequent travel restrictions, the International Mycological Association has made the difficult decision to postpone the IMC12. The COVID-19 pandemic has had negative consequences for planning the upcoming IMC, and will still restrict international travel for some time to come. One of the main aims of IMC meetings is to engage the youth, facilitate face-to-face meetings, and hands-on workshops in mycology. To this end, we have decided to postpone IMC12 to July 2024. The IMC12 meeting has to occur before the International Botanical Congress, which has since also been postponed to later in July 2024, and relocated from Brazil to Madrid, Spain.

Other News and Interesting Finds



Cyathus novaezelandiae is a member of the 'Bird nest fungi', a name that comes from its obvious resemblance to their namesake. Bird nest fungi are saprotrophic and can be found worldwide growing in clusters on decaying wood (Brodie *et al.*, 1975). *Cyathus novaezelandiae* is native to New Zealand but has also been identified in Australia (or as is the case in the attached photo, a Brisbane suburban pot plant) with local mycological societies having taxonomy keys available for possible species identification (<https://qldfungi.org.au/fungi-id/fungi-keys/fungi-keys-queenslands-birds-nest-fungi>). Bird nest fungi, like their cousin the 'cannon ball' fungi, have one of the coolest fungal dispersal methods for their spores, which are encased in structures called peridioles. Peridiole refers to the 'eggs' nestled within the fungi 'nest' and is named based on the Greek word *peridion* for 'small leather pouch'. Each peridiole purse is composed of a hard waxy outer shell which encases a mass of basidiospores and glebal tissue. When water

droplets fall into this nest the kinetic energy is redirected to propel the peridioles outwards, up to four feet; this is often referred to as the 'splash cup' method of dispersal. Most species of bird nest fungi have peridioles which are themselves 'sticky' however the *Cyathus* branch relies on a hidden tail (funicular cord) with a sticky end (hapteron) that is tightly coiled on the underside of the egg prior to release (Hassett *et al.*, 2013). During its expulsion the funicular cord extends and is used to attach the egg to the first surface it encounters (the aforementioned potted plant now has leaves covered in these small black dots, a testimony to the force of this mechanism). Fossil evidence has even identified this dispersal method within an ancestral bird nest fungus encased in amber, dating to at the least the Eocene, some 40-50 million years ago (Poinar, 2014).

Photo taken by Christina Stephenson, PhD student, University of Queensland.

References:

Brodie, H.J. 1975 The bird's nest fungi. University of Toronto Press.

Poinar Jr, G., 2014. Bird's nest fungi (Nidulariales: Nidulariaceae) in Baltic and Dominican amber. *Fungal biology*, 118(3), pp.325-329.

Hassett, M.O., Fischer, M.W., Sugawara, Z.T., Stolze-Rybczynski, J. and Money, N.P., 2013. Splash and grab: biomechanics of peridiole ejection and function of the funicular cord in bird's nest fungi. *Fungal biology*, 117(10), pp.708-714.



Apple scab/Apple black spot caused by fungal pathogen *Venturia Inequalis* observed in the Massey University orchards earlier this year. *Venturia inequalis* is the most economically important apple disease worldwide, and these photos are a great example of the damage this pathogen causes.



Photos taken by Dr Carl Mesarich, Senior lecturer, Massey University.



Camellia Petal Blight caused by the pathogenic fungus *Ciborinia camelliae*. Apothecia (bottom picture) of this fungus can be found during the winter months underneath Camellia plants among the dead flowers. While not of significant economic impact, this disease is devastating for Camellia growers, as it rapidly kills the blooms.

Photos taken Hannah McCarthy, PhD student, Massey University.



Tangerines (*Citrus reticulata* Blanco) and some of their hybrids, especially tangors (hybrids with sweet orange, *Citrus sinensis* L. Osbeck), are of great importance for the world's economy. *Alternaria* Brown Spot (ABS), the main disease affecting tangerines, is caused by the fungus *Alternaria alternata* "tangerine pathotype", that produces a host-selective toxin (ACT) leading to the formation of necrotic lesions in tangerines and their hybrids. Pictured here are characteristic necrotic ABS lesions in the fruit and leaf of tangerine.



Photos taken by Mariana Tarallo, PhD student, Massey University at the Citrus Center, Agronomic Institute, Cordeiropolis, Sao Paulo, Brazil.

We hope you enjoyed the July-August edition of the AMS Newsletter. If you have anything you'd like to contribute to the next edition, or if you would like to have your research or event featured, please contact our Secretary Laszlo Irinyi (geza25@gmail.com) or our President Tracey Steinrucken (ausmycsoc.president@gmail.com).