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1. Preface

It is March again! Could it really be that another (fiscal) year has just passed around? Definitely this was not a year as we all know; it was different in many ways, posing various new challenges for everyone. Some people struggled with preparation of their online lectures, meetings, and attendance of virtual conferences. Such events kept popping out like “mushrooms after the rain”, as we say in an old Czech proverb. I think we developed more “remote work” skills over time, and we got fairly used to most of the online presentation tools by now -- but I still personally lack very much the face-to-face contacts with students and other researchers. How about you?

2. IPSR symposium 2021: Program highlights

This year symposium was a revival of the 36th event cancelled in March 2020 due to COVID-19 outbreak. Same as in 2020, this year symposium was also affected and it has been forced to migrate to online format. Having the same selection of distinguished speakers already announced in 2020, the symposium offered an interesting blend of topics on how plant science can contribute to realization of SDGs. Let me highlight some of the ideas from the program covering biotic stress, a field closest to my own research in plant-insect interactions.

Depletion of fertilizers and environmental pollution from their overuse is one of the critical problems in modern high-input agriculture. Nitrogen fixation by symbiotic bacteria is a promising sustainable approach to reduce the use of inorganic fertilizers, however, as we all know, Rhizobia-mediated nitrogen fixation is mostly limited to legume plants, suggesting a specific co-evolution process taking place in the emergence of this intriguing biological phenomenon. As presented by Dr. Kiwamu Minamisawa (Tohoku University), Rhizobia, similar to pathogenic bacteria, surprisingly possess a type III secretion system for delivery of specific effector molecules to plants cells. One of these effectors, NopP is recognized by certain soybean varieties containing an R-gene, Rj2, which leads to abortion of nodulation

process (doi.org/10.1038/s41467-018-05663-x). It now appears that Rhizobium effectors may be playing both positive and negative roles in legume nodulation, such as NopP and Bel2-5 (doi.org/10.1038/s41598-021-81598-6)/ErnA (doi: 10.1073/pnas.1904456116), respectively. In addition, another recently reported R-gene NNL1 interacts with NopP, affecting the number of nodules in soybean (doi: 10.1038/s41477-020-00832-7). It seems that plants and bacteria involve in complex interactions resulting in pathogenicity and symbiosis, embracing the interplay of various bacterial effectors and plant R-genes. Until now, recognition of effectors was considered as main determinant of plant resistance to pathogens, however, it appears that they can be also crucial in the establishment of useful plant-microbe symbiotic interactions, at least in legumes. Understanding these interactions in detail will hopefully allow expansion of Rhizobia plant host range that will then unlock the non-legume crop plants for nodulation and symbiotic nitrogen fixation.

Plant diseases are another threat that affects sustainable development. In talk of Dr. Yukio Tosa (Kobe University), one could realize how easily new pathogens with potentially pandemic properties can spread around the world. As we learned in this presentation, wheat blast disease caused by Pyricularia oryzae was first detected in 1985 in Brazil, and it remained limited to Latin America for about 30 years. However, in 2016 the disease was found in Bangladesh, and in 2017 on the African continent in Zambia. It seems that wheat blast was able to overcome the wheat resistance mediated by common R-genes Rwt3 and Rwt4 throughout the large deployment of rwt3 wheat in Brazil, which allowed the evolution of pathogen, and primarily loss of its PWT3 avirulence determinant (doi: 10.1126/science.aam9654). As proposed by Dr. Tosa group, the rwt3 wheat thus served as a springboard for the host jump of Lolium (ryegrass) P. oryzae isolates to common wheat.

An interesting theory on design of novel resistance mechanisms to plant RNA viruses was presented by Dr. Kazuhiro Ishibashi (NARO). His group discovered that soybean plants resistant to soybean mosaic virus (SMV) encode the Rsv4 resistance protein, which is an atypical RNase H capable of cleaving double stranded RNA (doi: 10.1038/s41467-019-12052-5). Normally, this ubiquitous protein catalyzes the cleavage of RNA in the RNA/DNA hybrid molecules (https://en.wikipedia.org/wiki/Ribonuclease_H). As Rsv4 protein is able to “sneak” into viral replication complexes, in layman words, multiplying viral RNA that is protected by plant membranes, viral RNA can be effectively degraded in these compartments, resulting in enhancement of plant resistance. As many RNA viruses hide from plant nucleases in the hijacked membrane hideouts, Ishibashi group proposed that it might be possible to target Rsv4 into replication complexes of other RNA viruses for effective plant protection against disease development. The effects of viruses on plant defense against other pathogens was also discussed by Kiwamu Hyodo from IPSR.

In addition to examples above, participants were also able to learn about current progress in soybean breeding (Jun Abe, Hokkaido University), barley genomics (Kazuhiro Sato, IPSR), photosynthesis regulation (Jianjin Shen, Okayama University; Keisuke Yoshida, Tokyo Institute of Technology), involvement of peptide signaling in drought stress (Fuminori Takahashi, RIKEN CSRS), and maintenance of mineral homeostasis in rice plants (Jian Feng Ma, IPSR).

In closing of my brief commentary about 2021 IPSR symposium, we already look forward to the next annual event announced for February-28/March-1, 2022. I hope everyone can join us here in Kurashiki next year!

3. Recently released publications

Pastawan, V; Suganuma, S; Mizuno, K; Wang, L; Tani, A; Mitsui, R; Nakamura, K; Shimada, M; Hayakawa, T; Fitriyanto, NA; Nakagawa, T
Regulation of lanthanide-dependent methanol oxidation pathway in the legume symbiotic nitrogen-fixing bacterium Bradyrhizobium sp. strain Ce-3
JOURNAL OF BIOSCIENCE AND BIOENGINEERING 130(6): 582-587 (2020)
https://doi.org/10.1016/j.jbiosc.2020.07.012

Tabara, M; Koiwa, H; Suzuki, N; Fukuhara, T
Biochemical characterization of the dicing activity of Dicer-like 2 in the model filamentous fungus Neurospora crassa
FUNGAL GENETICS AND BIOLOGY 146: 103488 (2021)
https://doi.org/10.1016/j.fgb.2020.103488

Nakayama, S; Sugano, SS; Hirokawa, H; Mori, IC; Daimon, H; Kimura, S; Fukao, Y
Manganese treatment alleviates zinc deficiency symptoms in Arabidopsis seedlings
PLANT AND CELL PHYSIOLOGY 61 (10): 1711-1723 (2020)
https://doi.org/10.1093/pcp/pcaa094

Tazawa, M; Katsuhara, M; Wayne, R
Age dependence of the hydraulic resistances of the plasma membrane and the tonoplast (vacuolar membrane) in cells of Chara corallina
PROTOPLASMA (2021)
https://doi.org/10.1007/s00709-020-01596-9

Shahi, S; Chiba, S; Kondo, H; Suzuki, N
Cryphonectria nitschkei chrysovirus 1 with unique molecular features and a very narrow host range
VIROLOGY 554: 55-65 (2021)
https://doi.org/10.1016/j.virol.2020.11.011

4. International Joint Research introductions * 72-th series *

In March, we received a letter from Switzerland, kindly provided by Dr. Carolina Cornejo. Carolina is a biologist focusing on pathogenic interactions between plants and microbes. She visited Japan in March 2019, just before the outbreak of COVID-19. I think she tells it all in her short story.

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Hello everyone, I am Carolina Cornejo from the Swiss Federal Research Institute WSL in Switzerland. Last year, I had the pleasure to visit IPSR and the honor to work at Prof. Nobuhiro Suzuki's Lab. My journey started at February 20th and, I remember, I was so excited about travelling for the first time to Japan! I arrived at the Okayama airport on a sunny Saturday but cold air blew when I left the airport building — a touch of spring was in this cold air. My scientific goals were clearly defined. My expectations as a curious being were open to Japan as a whole. People, science, arts, history, food culture — everything aroused my interest.

Mycoviruses took me to Suzuki's Lab. Since decades, the discovery of the mycovirus CHV1 has interested phytopathologists due to its hypovirulence effect on the infectious Cryphonectria parasitica. Cryphonectria is an ascomycetous genus associated with economically significant canker disease of trees. CHV1 causes a growth and reproduction arrest so effectively in C.

parasitica that it is currently being used as biocontrol agent in Europe—also our lab applies CHV1 to control the chestnut blight disease in Switzerland.

Recently, I isolated an unknown mycovirus from the fungus Cryphonectria naterciae, which in turn parasitizes both Castanea and Quercus trees. Since viruses are a rather new scientific subject for me, I asked Prof. Suzuki for support in characterizing this new viral species. My main objectives at IPSR were to learn techniques for characterizing viral genome and to gain better biological insight into mycoviruses. Manifold questions drive my interest in host-virus interaction. First at all, the intriguing matter of a complex network including a tree hosting an ascomycete hosting a virus. How can they keep the balance over three symbiotic levels? Is it possible that the virus switches from its fungal host to another fungal species or even to a tree?

My stay in Kurashiki was so inspiring! First at all, I was surprised at how international and highly motivated was Suzuki's Lab. A group including many young scientists, working fully committed on research. They all welcome me friendly and taught me intensively in lab techniques. I was invited to scientific presentations that helped me deepen my understanding of mycoviruses. I was also very excited about astonishing biological correlations this lab has discovered — a virus that facilitates infection capacity of another virus, while both together infect the same host! Last but not least, there was time to discover the old town of Kurashiki, to visit an Onsen, museums, jeans manufacture and to taste as many different dishes as possible!

Finally, I was able to achieve most of my goals, even if I could not keep to the original plan due to Covid-19 pandemic. I was called to return to Switzerland by the end of March, what abruptly interrupted my stay at Suzuki's Lab. The stay was interrupted, yes, but not scientific collaboration that our both labs have continued to intensify extending it to new research projects.

Let me, finally, express my thanks to Prof. Nobuhiro Suzuki and his lab for their respect and hospitality. I am also deeply grateful to the Collaboration Committee for making my stay at IPSR possible. I hope, once, I will return to Japan that has not ceased to fascinate me since that sunny, cold Saturday at the Okayama airport.
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5.Student recruitment - Online Graduate School Briefings
The Institute of Plant Science and Resources is an outstanding place for graduate students to engage in various aspects of plant research. The Institute will be holding two online briefing sessions via Zoom on the following dates:

17-March 2021 (Wednesday) 13:00～16:00
22-March 2021 (Monday) 13:00～16:00

Registration page (Japanese):
https://www.rib.okayama-u.ac.jp/nucleus/Daigakuin/setsumeikai2020Sep.html
Information page (English):
https://www.rib.okayama-u.ac.jp/Education2020/setsumeikaiOL.html

[Q&A] (English - Japanese)
Toshio Yamamoto, Institute of Plant Science and Resources,

Okayama University
TEL： (086)434-1205 E-mail： yamamo101040@okayama-u.ac.jp

6. Posting request

In the PSSNet E-mail magazine and website, we aim to share various information about research in plant (stress) science. We cordially invite all PSSNet members to contribute information about their latest publications, meetings and seminars, staff, postdoc, and student recruitments, etc. Please send your information directly to [pssnet-admin@okayama-u.ac.jp] E-mail address.

7. Postscript from this issue Editor

Well, what was the most annoying thing for you in the past few years? For me it was probably the increase of "scientific" spam mails. I don't know in your case but I find them now in my email box practically every day. At least ten. The reason is that, as researchers, we are obliged to open our email addresses to enable efficient contacts with other colleagues in our publications, websites, etc. Such "naked" addresses become a way too easy targets for the spam predators.

However, I always wonder if sending these emails makes good to anyone. Would you reply to invitations that make no sense to you or order products that you do not need - even in your wildest dreams? The other day, I really had to laugh when I received a request to review a paper for the "Journal of Substance Abuse and Alcoholism". Did some drunken images of me leaked to the Internet to make me a qualified reviewer for this journal? By the way, does this journal really exist? I did not bother to check but I doubt.

What worries me, however, is the fact that spammers become more and more sophisticated and one day we will not be able to tell if this mail is real or just another spam. We are definitely going to miss important information because of being afraid to click on the links in our emails.

Can researchers be more protected from pretentious spams in the future? If someone has a good idea, please share it with the other PSSNet users. At least I would sincerely appreciate any practical advice how to keep may emails safer!

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